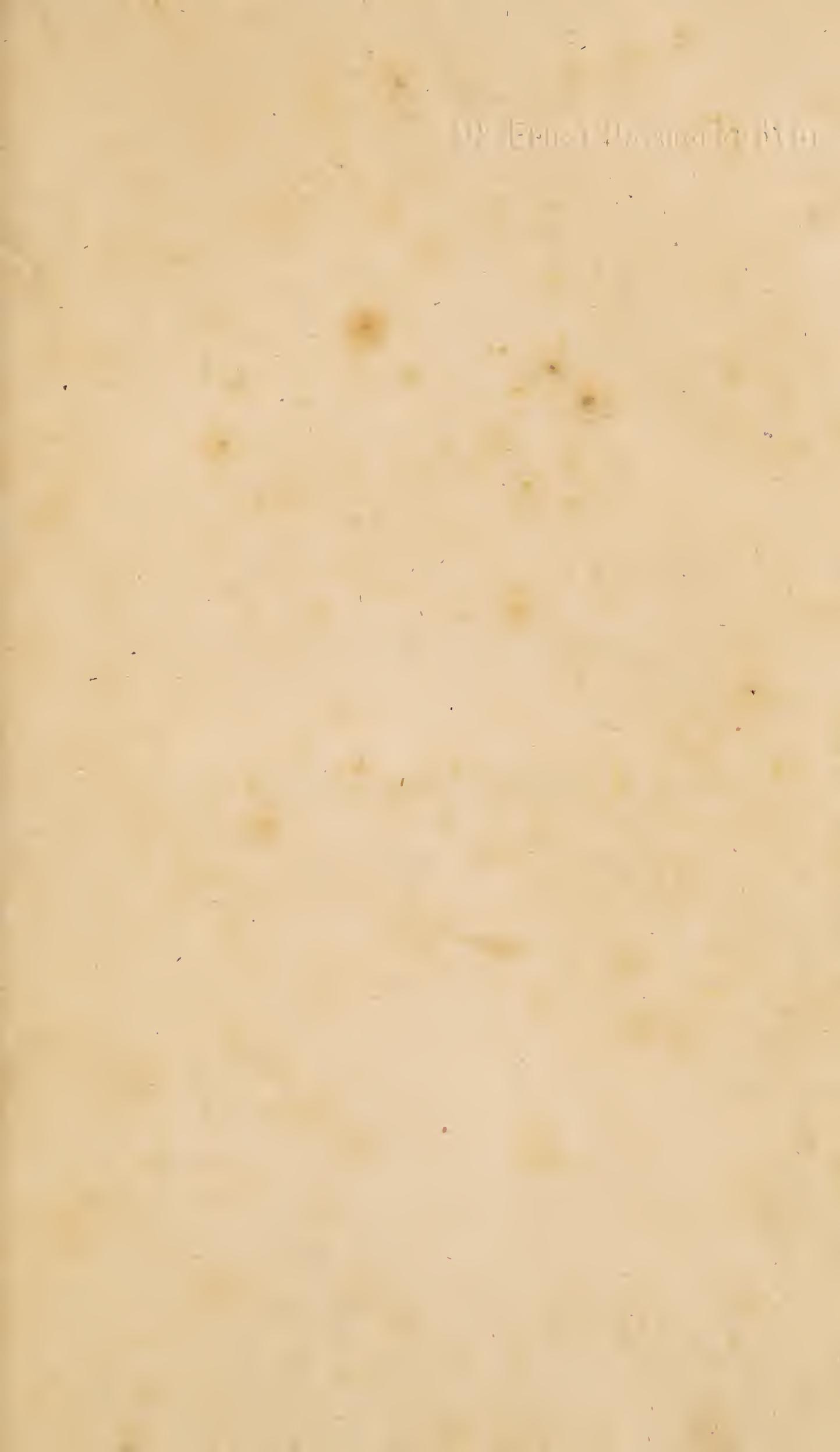


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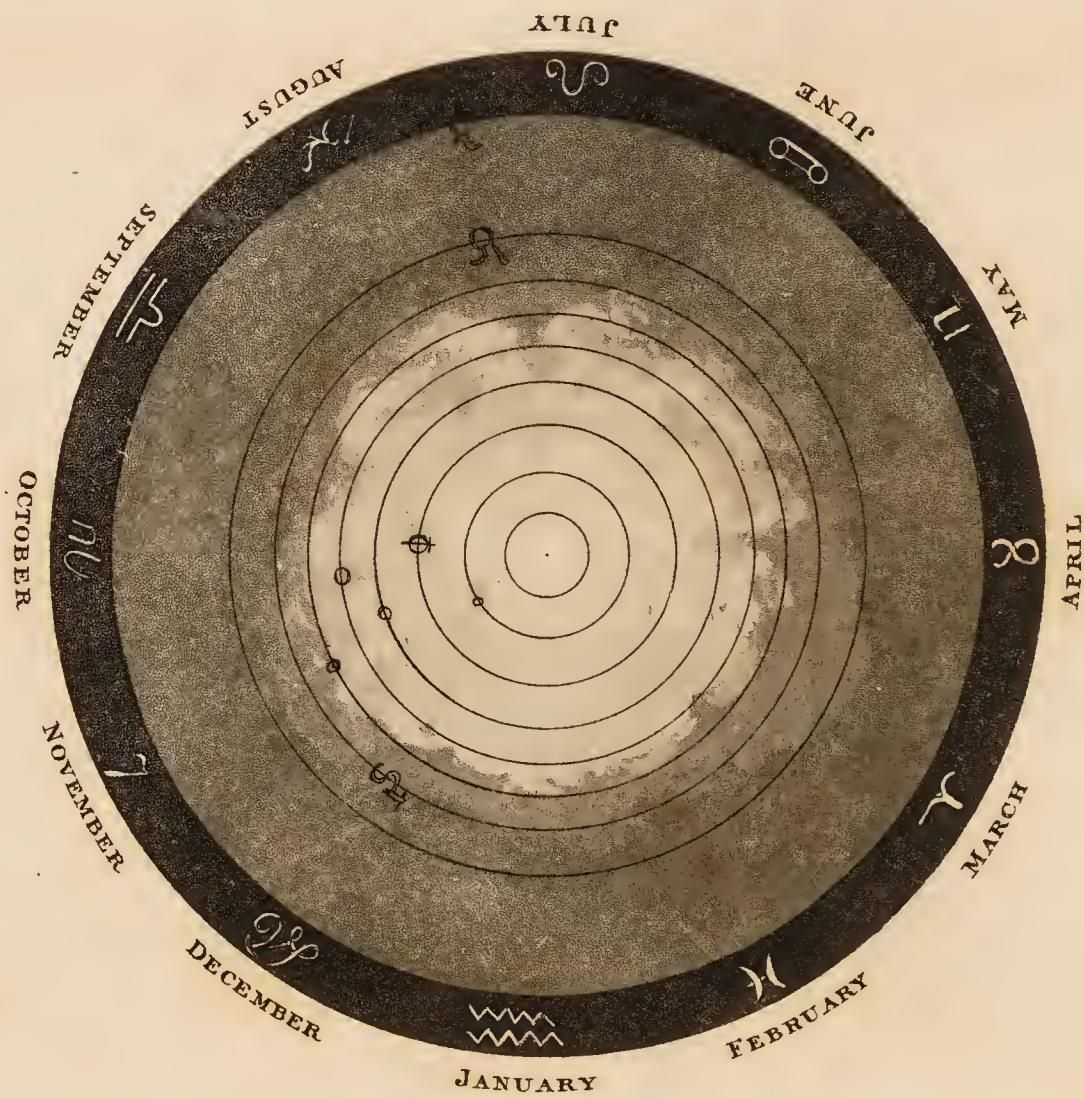
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AN
HISTORICAL ACCOUNT
OF
INVENTIONS AND DISCOVERIES,
&c. &c.

MARCHANT, Printer,
Ingram-Court, Fenchurch-Street.

FRONTISPICE.



G.H. Jones sculp,

Engraved for Williams's Inventions.

A DIAGRAM of the UNIVERSE on the COPERNICAN SYSTEM improved by the most recent discoveries.

st 1	Inner Circle	..... Orbit of the SUN.	th 6	Circle	..... Orbit of	CERES.
d 2	D°.....	D°..... of MERCURY.	th 7	D°.....	D°..... of	PALLAS.
d 3	D°.....	D°..... of VENUS.	th 8	D°.....	D°..... of	JUPITER.
th 4	D°.....	D°..... of the EARTH.	th 9	D°.....	D°..... of	SATURN.
th 5	D°.....	D°..... of MARS.	th 10	D°.....	D°..... of	HERSCHEL.

Published Janst 1, 1820, by T. & J. Allman.

— L O N D O N . —

AN
HISTORICAL ACCOUNT
OF
INVENTIONS AND DISCOVERIES
IN THOSE
ARTS AND SCIENCES,
WHICH ARE OF
UTILITY OR ORNAMENT TO MAN,
LEND ASSISTANCE TO HUMAN COMFORT, A POLISH TO LIFE, AND RENDER
THE CIVILIZED STATE, BEYOND COMPARISON, PREFERABLE
TO A STATE OF NATURE;
TRACED FROM THEIR ORIGIN;
WITH EVERY SUBSEQUENT IMPROVEMENT.

BY J. F. LAKE WILLIAMS.

IN TWO VOLUMES.

VOL. I.



LONDON:
PRINTED FOR T. AND J. ALLMAN,
PRINCE'S STREET, HANOVER-SQUARE.

1820.



TO THE
RIGHT HONOURABLE
WILLIAM,
EARL BEAUCHAMP,
&c. &c.

MY LORD,

SUFFER me not, by endeavouring to avoid the meanness of adulation, to run into the contrary extreme, whilst I am addressing a nobleman of your Lordship's discrimination. I will endeavour to be understood to be above the former, and I am certain the profound respect I entertain for your Lordship's character will effectually protect me against the latter.

Those who know your Lordship are well apprised of that intelligence which ornaments your

mind, and exalts your title; they also anticipate the benefits your wisdom is to confer upon that branch of the legislature entitled to your councils. They expect every perfection of moral excellency from the superiority of your understanding, tempered by the goodness of your heart; and among such I have the honour to present myself; and whilst I beg to present to your attention an offering I have endeavoured to render worthy your acceptance, ever remembering the advice of *Seneca*, and endeavouring to comply therewith, I intreat to place these volumes under the fostering protection of your Lordship's name, relying upon that chastened disposition of mind, matured by every description of human learning; the austerity of which is softened by the purest equanimity and benevolence. To a mind so well qualified to judge, so amiably disposed, I appeal to forgive those errors it cannot palliate, at the same time, trusting for the smile of approbation to what has been essayed for general good.

Conscious that I appear before a public who may not be, generally, so well qualified to judge, and who will not feel so disposed to indulge any incautious oversight, nor will they be inclined so much to encourage the man who has endeavoured to produce something worthy of its patronage, or to grant its protection to an unknown author, as will the nobleman to whom this address is made. Under this impression, I have the honour to assure your Lordship that I am,

My Lord,

Your Lordship's most obedient,
devoted, and humble servant,

J. FRED. LAKE WILLIAMS.

33, *Euston-Crescent*,

1st Jan. 1820.

AN
HISTORICAL NARRATIVE
OF
INVENTIONS,
&c. &c.

INTRODUCTION.

AS the subject we propose to treat upon necessarily involves numerous considerations, and of divers periods, the necessity of pursuing *some* systematic arrangement must be obvious.

That which is here *proposed to be* adopted will be discovered the most simple and perspicuous which can be conceived,—the order of nature, the *synthetic*. We first propose to investigate the origin of those arts, from whence man, in his primary state, derived his portion of sublunary enjoyments, his comparatively small share of happiness, and his most consolatory repose. These, of course, include the satisfaction of those necessities denominated, by philosophical and statistical writers, HIS WANTS of the *first*, *second*, and *third* necessities.

For this purpose, we have to request our readers to divest themselves of present consciousness, and to allow us to convey them back in *idea*, by retrograde motion, at least 4500 years into the abyss of time.

Man is acknowledged to be the *patient* of sensation;¹ whence we discover, that from one or other of his animal senses all his wants proceed: and from thence, also, are produced all his sensitive enjoyments.

As, by general acceptation, ^{imperf.} *literal* signification of the term *want* implies a degree of pain; so its removal,

¹ *Vide Helvetius on Man*, v. i. §. 11. ch. 1.

consequently must by inference designate pleasure. All his wants are discovered to be the produce of corporeal sensibility;² and all those termed wants of the FIRST *necessity*, are composed of those natural cravings which nature imperiously requires should be satisfied; as the gratification of hunger, the allaying of thirst, the amelioration of the vicissitudes of heat and cold, repose from excessive labour and incessant fatigue, with some others. Those of the *second* necessity include all such as are not enumerated in the first *class*; particularly those preliminary to their gratification: as, he must cultivate land before he can enjoy its fruits; also such, which are necessarily essential to his being, as clothing, shelter, &c. His wants of the *third* necessity may be denominated that *care* which becomes his DUTY to employ for all those relatively connected with him, including his parents, women, children, servants, domestics, social and mute, and all others of a similar nature.

As the ancients divided past time into various epochas, 1st, unknown; 2d, fabulous; 3d, traditional; and, 4th, historical;—so may the moderns make a somewhat similar division of the space which has occurred since that period.

By taking up time where it was left by the ancients, and considering it, perhaps, for the two *first* ages, as partially dark, or twilight, because we should suppose the effulgence of the orb of science, though then set, must have left upon the mental atmosphere of remaining men, at first an irradiation; *second*, a partial light, or *twilight*; the *third* division, should be called a mental night, because the sun of intelligence had sunk 18° below the horizon of the mind; and, in the *fourth*, a midnight darkness is presumed to succeed,—a darkness which remained for ages!—and the gloom of which was increased tenfold from the louring humidity of the horrible tempest of superstition; communicating a dread to the human mind, which may be much better conceived than described. And it was not until the liberal hand of heaven had dispensed the blessings of rational reform, that sciences, arts, and purity of morals, assumed a more congenial aspect. The introduction of the glorious art of printing, then lately invented, in the 14th or 15th century, has tended more, perhaps, than any other external circumstance, to aid the cause of true belief, in matters of religious opinion as well as in scientific truth.

² *Vide Helvetius*, v. i. §. 11. ch. 1.

The high importance of that useful art cannot be sufficiently appreciated, but by those to whom *true*—the natural—religion and scientific truth are dear.

It has been much regretted, but not more than it merits, that the great share which *Inventions* and *Discoveries* have at all times had, in increasing the moral happiness of our species, should not yet have found historical pens to do the subject justice. None can more lament this circumstance than does the author of this Historical Essay; whilst it grieves him to notice, that in the recording those transactions which blacken and debase human nature, as the projects of mad ambition, its deplorable consequences, with the crimes of priests and kings, talents have been engaged of the most brilliant estimation, to perpetuate the mass of infamy which the vicious nature of man has engendered and congregated. Just as though the reverse of what *should* be, was what we *ought* to feel: among others, an obliteration of every tie of gratitude for those meritorious actions which imperiously demand our warmest thanks. Whilst a perpetuation, in indelible characters, is engraven to record actions, which the rational portion of our species would judge correct, were the memory of them enshrouded in eternal oblivion: which would long have been their fate, had they not met with pens ever ready to have told the mournful tale, when, from *existing circumstances*, it would have been next to *impossible* they should have been forgotten! In consequences arising from tediously protracted wars, purposely lengthened to answer the culpable prospects of ambition and avarice; resembling, in the moral economy of the world, a revolution, nearly equal to a proclamation of the death of nature in the mundane system! This observation applies to all times and every country.³

The motives for this strange circumstance, in any but the present order of things, would appear, indeed, in-

³ We find no more than six authors on record, ancient or modern, who have professedly treated this subject, with some others who have spoken of it in a desultory manner. The names of those who have confined themselves to this theme are *Pliny*, *Polydore Virgil*, *Pancirollus*, his commentator, *Salmuth*, *D'Origny*, and Professor *Beckmann*; the last has supplied the world with much valuable information, but he is miserably deficient in systematic arrangement, and the more ancient researches, for unquestionably numerous inventions and valuable discoveries were made previous to the period of either *Grecian* or *Roman* splendour, and the Professor has not gone farther than that; his records going no higher than those ages of a people, though comparatively ancient, yet others more eminent, existed long before them, with whom the *Greeks* and *Romans* were but as of yesterday.

explicable: however, they are to be traced to two circumstances, whence their obvious origin:—i. e. that jealous envy which appears co-natural to the minds of certain men, who are themselves incapable of great actions; and because the brilliant actions which attend success in the field, are better calculated to ensure the praise of its subject, and at the same time that of the author, than are the peaceable occupations of the scientific, or the learned labours of the philosophic and wise.

A preconviction of this lamentable truth was among the motives which induced the author to make the subsequent arrangement, to record such circumstances which came within the very limited sphere of his own knowledge, and diligently to collect such others from the most accredited authorities; hoping to render a small tribute of justice, though imperfect, to the memory of those to whom ample fame is due. He regrets the shortness of the space prescribed to him, prevents his executing it in a manner worthy of the subject, and equal to its importance.

The previously enumerated wants of man comprehend, we believe, all his positive actual necessities; the other cravings of his nature may be considered separate from these, and are rather the creatures of habit, as such, are extraneous to his being, but from habitual indulgence, sanctioned by fashion, confirmed by precedent, and allowed by general adoption, they appear necessary to his existence. Nevertheless, as many of these arise from mere *use* they seem to be indispensable; so many may be regarded as innocent, some even meritorious, from their elegant nature and the comfort he thence derives; also from the sustenance their preparation affords to many thousands of individuals. There are, moreover, numerous others which tend to humanize man, and call forth his most exalted powers and the noblest energies of his nature, but which may not be essential to his being. All those, from the circumstances named, will have attention, commensurate with their importance, in the following sheets.

In all affairs of various opinion, the great cause of dissension between contending parties is to be ascribed, perhaps, to their mutually miscomprehending terms which they use in discussion. This induces us to affix a definite meaning to such expressions we shall have most occasion to use; confined to the words **INVENTION**, **DISCOVERY**, and **USE**.

By **Invention** is to be understood the projection and creation of something which has not yet had being. Man

had no definite idea of the power of steam, previous to the *Marquis of Worcester* having written his “*Century*,” since which the steam-engine has been produced.

Discovery means the developement of something which has had previous existence, but which has yet escaped attention. The blood circulated, for instance, previous to *Harvey's* discovery of that fact.

Use is applied to those circumstances where neither invention nor discovery have any interference, and immediately applies to such things as man is instructed in by God, or from nature. He eats when hungry, drinks when thirsty, and prays when in trouble.

Diodorus Siculus says, “*Necessity* was man's first instructor, which made him skilful in every thing, being an ingenious creature, assisted (as with so many servants) by hands, speech, and a rational soul, ready to put every thing in execution.” *Lib. i. cap. 1.*

Historical Notice of Man. — Under whatever circumstances human society has been placed, it will be discovered that the majority of its members have been always labouring under a portion, at least, of unhappiness, disquietude, and discontent. In order to obtain a clear and comprehensive view of the several subjects we propose to discuss, and to establish the allegation just made, it will be essential to take a retrospective glance of society, from its primary existence down to the present period. Should this appear to enlarge our inquiry beyond necessary limits, our readers will pardon the trespass, when they are assured that they will find, perhaps, a reward for patience, in discovering novelty blended with truth, and both sanctioned by nature.

In order to remove those discontents, which nature appeared destined to endure from human unprotected insulation, the omnipotent power of the Highest endued man with conspicuously eminent faculties, for the amelioration of his grievances, though not for their entire removal: this not being apparently the object of the Creator, must not be expected by the creature. For which purpose we find him endued with powers equal to the *invention* of things new,—to *discover* objects not yet perceived,—and to *use* whatever heaven or nature permits.

We have the history of man from two sources,—namely, from a sacred *impetus*, or inspired and prophetic authority, and from human conception. We judge of the *CLAIM* of the *first* to our credence from its relating such circumstances which could not have been known by man, if unassisted by

supernatural authority; as a further corroboration, we look at the *consistency* of the relations throughout, and also judge from the accomplishment of the prophetical predictions.

The test of scrutiny, by which the *second* is established in general credence, is also *consistency* in relation, in its adherence to rational probability, and the general assent of all nations and ages to the truth, or rather the *probability* of what such authors advance.

The sacred records of the Israelites have stood investigation by similar rules to the first, as relative to that history for ages; and by every description of men,—by many, especially in latter days, who would, could any thing rational have been urged against it, not have failed to expose its fallacy;—they have *endeavoured* to do so, but their pretended tests have all failed, to the utter defeat of the authors, exposing their wicked and weak malignity.

By rules similar to our second, *Diodorus Siculus*, the Greek author whom we have selected, has been tried, and he has stood the ordeal of historical criticism for about 2000 years; and yet stands as one of the most respectable of general historians; as well from the excessive labour he employed to collect materials for and to write his general history, as for the care he took to relate only truths, ever preparing the mind of his readers to receive such accounts he gives as merely traditional, in the same manner he himself received them. In the first place, he alleges,—“ That he spent *thirty years* time in writing his history: and, for that purpose, travelled through a great part of Asia and Europe;” (it is also equally certain, that he visited a part of Africa, having travelled into Egypt; we assert this from the authority of his own confession, and from others who knew the fact:) adding,—“ that we ourselves might be eye-witnesses of most of the parts and places that were necessary for the carrying on of our design in this work.” Such things as he does not describe from personal knowledge, he took his relations from the most esteemed authorities he could find; and whatsoever exceeds his own credence, he gives his readers the full advantage of his incredulity, proposing it in a doubtful sense, as, “ *they say*,” and others of a similar import, letting them judge for themselves.

The authorities of *Moses* and *Diodorus* are very dissimilar, it is true, as may be expected; for the Jewish legislator, treating of his subjects under the influence of an irresistible and fervid influence, proceeding from the pure spirit of Omnipotent Truth;—whilst the Greek delivers his through

the medium of an intelligence, injured by the contact of a false theogony, although beautifully imposing, yet full as absurd as his philosophical belief;—the common faith of Greece, in matters of religion and philosophy.

Their religion, consisting in a belief of deities of the creation of their own poets,—being personifications of the elemental parts of nature, homogeneously combined with apotheosized heroes;—such were their gods. Their philosophy was of that system first promulgated by *Mochus*, the *Phœnician*, afterwards embraced and publicly taught by *Democritus*, of *Abdera*, next by the simple and abstemious *Epicurus*, at *Athens*, and generally received by all Greece, as well as afterwards by Rome.

The chief tenets of which consisted in the adoption of a *postulate*, that from *Kaos* the world was formed, by principles then inherent in the *chaotic* materials;—since discovered to exist in nature, without the intervention of any primary cause, adequate or general: namely, that it is a principle in fire, smoke, and *all* light bodies to ascend, and for those of a dense nature to fall or gravitate, by reason of their superior weight; for water to find the lowest place or its own level; that the whole of all terrestrial materials, including the air, and in fact general nature, were formed from an infinity of globular or elliptical atoms,—formed in that shape by occasion of incessant motion; whirling about in their chaotic state, each particle, being attracted by the homogeneous nature of similar particles in its vicinity;—these particles they called *corpuscles*.

They imagined that all animated creatures first sprang from the earth in its infancy, (when they thought it possessed more genial power,) at that period, like herbs or trees, but with this difference in the former case, in the shape of eggs or pustules upon its surface, which were matured in the night by dew or moisture, to just infantile proportion, and by day the heat of the sun and winds communicated to the infant embryo sufficient strength to enable it by degrees to burst its cerement; when such creatures as had most of fire or air in their composition, as fowls, birds, &c. mounted aloft, their nature being to ascend; those which had most of gravity, as bipeds, quadrupeds, &c. kept to the earth; and the animals called fishes, presently hastened to the waters, their most co-natural element.

When all those creatures were once produced by the energetic vigour of the earth, and when it could produce no more, says our historian, then all those creatures reproduced their kind by mutual copulation.

Such appears to convey a pretty clear but general idea of the system of philosophy invented by *Mochus*, or *Leucippus*, the master of *Democritus*, and adopted by our author. It would, indeed, be a waste of time and space to observe at this day on the folly of such a system when compared with the more rational cosmogony of Moses. And yet there is one modern author of high reputation who has ventured to maintain those principles in part, who is *Des Cartes*.

The Jewish legislator, by ascribing proper effects to their only true and adequate cause, the Omnipotence and Omnipotence of the Most High, furnishes us with the only true and rational *origin of all things*, which produceth instantaneous conviction; whilst the ingenious and speculative theory of the *Phœnician* or *Grecian* philosopher's system, evaporates into “thin air;” because he does not admit the existence of a cause proportionate to the grand effects produced.

The *Egyptians* are universally confessed to have been the first people civilized, — to have excelled all others in the invention and perfection to which they brought those sciences and arts which are the ornaments of man, and which constitute the utilities of life.⁴

They were the immediate descendants of Noah, by Mizraim, the second son of *Amyn*, *Hamyn*, or *HAM*. A people who have left such pledges behind them of mental superiority, which will not let us doubt of their transcendant eminence in intellectual acquisitions; because, judging from a criterion furnished us by one of our most learned professors, “*that we must judge of the attributes of every people, of whom we have no authentic, certain, or intelligible materials remaining, to proceed upon, from such monuments of art they may have left behind them.*”⁵ The tyranny of ambitious men having deprived us of their written verbal records, we must (as yet) resort to the above criterion to form our judgment of the people now considered. Among the first princes of Egypt appeared some illustrious sovereigns,—highly meritorious individuals, in the first character greatly beneficial to their country; and, in the second, eminently serviceable to mankind in general: to whom are ascribed the invention of those arts we may presume man, in a state of nature, stood most in need of: and the benefit of which we at this day experience. These were such, which, in the senti-

⁴ *Vide* the learned and Reverend Bishop Warburton's discourses upon this subject.

⁵ John Flaxman, Esq. R.A. and Professor of Sculpture to the Royal Academy of London, also Honorary Member of the Academies of Florence and Carrara, &c.

⁶ Cambyses ranks first; Misphagnorthosios, the Arab shepherd; and, lastly, the Mussulman, Omar, the Caliph, in A.D. 637.

ment of the Egyptian historian, “ were most conducive to the satisfaction of the wants of man.” As who discovered such essential things for man’s use, as the gathering and preservation of the fruits of the earth; collecting and cultivating corn; making wine; and where vines would not grow, he taught to make *Zythen*, beer or ale, from barley. These mortals were Egyptian princes, but chiefly **OSIRIS** and **ISIS**, who, from the benefits they conferred on humanity, but chiefly for the great good their own subjects experienced, from the very ingenious devices and highly meritorious actions, performed in their lives, after death were immortalized by their subjects, and thought still to bear an affectionate interest in their native kingdoms, and to participate in the direction of their concerns. They were apotheosized and accordingly worshipped; and it was a common tenet in Egyptian belief that they, *i. e.* *Osiris* and *Isis*, occupied thrones in the two chief planets,—the sun and moon.

But, although the primary benefits which the Egyptians and humanity had received are ascribed to these sovereigns,—yet it is admitted that *Thoaut*, *Taaut*, *Toth*, or *Menes*, known to Egypt by all these names, to the Greeks as *Hermes*, to the *Etrurians* as *Marcol*, and to the *Romans* as *Mercury*, was eminently serviceable to Egypt and the world from his inventions. He is said to have been the sacred scribe of Osiris, whom that prince consulted in all things, and suffered himself to be steered by his advice. He first taught men to speak distinctly and articulately;—gave names to many things which had none before; he found out letters, and instructed in the worship of the gods:—was the first who observed the motion of the stars; he invented music, arithmetic, taught the manner of wrestling and athletic exercises; found out the art of curious graving and cutting stones, statues, &c.

Although Greece has been deservedly eminent for her fine and delicate execution of the arts of polished life;—her claim for original invention appears to be more doubtful than is generally conceived. It is a known fact, that her legislators, who founded her religious rites, her poets, musicians, and philosophers of eminence, all went to Egypt for instruction. Egypt was, at one time, to them, what Athens was at a subsequent period to the Roman people,—considered as the grand university of the world. Those exquisite laws observed by Greece for the moral government of her people, those rules of chaste and beautiful art, for which she is so eminent, all first emanated

from Egypt to Greece. In fact, the two grand characteristics of those people appear to be distinguished thus, — the Egyptian was the original inventor, the Greek the better artist, who executed the designs of the former to admirable perfection.

Indeed, the most famous of Greek philosophers, *Aristotle*, appears to make the concession, when he observes that man is *ξων μημηλιον*, which definition appears to be just, when we reflect upon the difficulty of invention, and feel how hard it is to define what has not yet had being; to give form to what exists, at present, but imperfectly in our own mind: then the opinion of the philosopher is evidently correct, when he alleges that man, generally speaking, is more an *imitative* than an *inventive* animal.

The great benefits resulting to humanity from the invention of those arts which are of so much importance to man, cannot be enough appreciated, when we consider *Horace's* conception of the species is founded in truth; — who alleges that man, in a state of nature, is *mutum turpe et pecus*; his chief natural habits we may believe to be *filthy*, his appearance, in a state of nature *disgusting*, and his natural disposition, indeed, *beastly* and depraved. Therefore we again urge the claim of the ingenious upon the GRATITUDE of posterity.

Perhaps the claim of invention by the Romans is assumed no more than it merits, for they had but little occasion for the invention of arts, &c. beneficial to the species, when it is recollected that their genius was solely for warlike enterprises; they, at least in early days, existed entirely as a military people, and, among those nations they conquered, discovered every invention had been perfected which was conducive to human comfort, and to the satisfaction of those wants required by nature. The characteristic of this people is distinguished more by the *fortiter in re*, than the *suariter in modo*.

The Chaldeans, Ethiopians, Assyrians, Arabians, and numerous other Oriental nations, have claim for a large share in the honour of *original* inventions: doubtless all those people have a just demand; — because it will be remembered, that people emanating from an original circle will, in a distant district, have new wants arise; those must be satisfied, and as necessity is its parent, inventions have among such also been projected, which will meet with all attention in their proper places.

To conclude this article, we observe, that this selection of inventions, discoveries, &c. we have reason to hope may be found deserving of the attention of the public, and worthy

its patronage; as, we think, we can allege, without fear of controversion, that these volumes will contain infinitely more matter of utility and of further research, than is to be found in any preceding work of this description: certainly in a more brief compass, and at a greatly reduced price.

OBSERVATIONS ON THE FIRST PERIOD OF PRIMÆVAL SOCIETY.

The Chase.—What will be found in another place, where it is said, that the general sustenance of the first men consisted only of fruits, and the produce of the chase; what we shall observe when we are speaking of ancient kings, also refers to this particular article. For the first of sovereigns, *Nimrod*, “was a mighty hunter before the Lord.”—Gen. x. 9.

“ Bold NIMROD first the lion’s trophies wore,
The panther bound, and lanced the bristling boar;
He taught to turn the hare, and lay the deer,
And wheel the courser in his mad career.”

Tickell.

In primitive times, the earth was soon filled with creatures which were either propitious to man’s use or obnoxious to his repose. The one description of animals he hunted for food, because they were given for that purpose; and the other he destroyed, because they were inimical to him. The hunting season usually commenced on the solar ingress into Sagittarius, when the asperity of the northern Etesian winds, in districts north of the equator, and partial frosts, had checked the circulation of the nutritive juice of nature in plants and trees; whence their foliage fell off: the woods, with which most parts of the earth then abounded, became discharged of leaves, so that the objects of the chase could be seen, and the better pursued.—*Vide L’Abbé Pluche’s Hist. du Ciel.*

Mode.—In hunting all quadrupeds, dogs have been constantly employed, of different species, regulated by the nature of the game they sought; many of them possessing finer olfactory powers than others; some eminent for fleet-

ness; whilst in others strength was the chief characteristic. Some few were distinguished for both strength and fleetness; as the Irish wolf-dog, the fox and blood hounds. The greyhound was then, and is now eminent for its rapidity in the chase; and sufficiently strong for the game it usually pursues. The terrier and spaniel possess an eminent sense of smelling; all dogs are famous for some attribute or other, and most were found serviceable in this exercise. But with dogs of one description or other, hunting was generally performed, accompanied with men on foot and horseback: and this mode has continued with little variation.

In early times, those who went to the chase equipped themselves as though they were going to battle, at first with clubs of wood and metal, sometimes of both together. In later days they have used spears, shields, battle-axes, lances, &c.

Fowls were usually taken before the discovery of gunpowder by certain carnivorous birds of the æqualine species, of slender form and great strength of pinion, called eagles, falcons, hawks, &c. wherefore the general term for obtaining feathered game was **FALCONRY**: the birds, pursuing others, being first carefully trained to the exercise. Some few, indeed, were killed by bow and arrows; whence came the term **ARCHERY**. In *Mexico*, the natives had a method of shooting birds by small pellets, which they emitted through cylindrical tubes by their breath.⁷ But a more certain destruction now awaits the feathered race from the cylindrical gun and the percussive force of gunpowder.

The practice of hunting has been in latter days confined to, or rather assumed by, kings and their nobles; whence originated *game laws*, which are regarded in most nations as severely oppressive upon the free agency of man. But they are much more so, in some countries than in others, where an infringement of them is punished by as severe penalties as murder or robbery. Under the ancient regime, this was, for instance, the case in *France*.

In the most early civilized countries, *i. e.* Persia, Greece, and Rome, the exercise of hunting was cultivated by princes, nobility, the rich, and most polite of the people, ladies and gentlemen. At present it constitutes the chief diversion of eastern princes, who, generally with their whole court, seraglio, and trades-people, consume nearly one-half of the year in the chase of various animals.

⁷ It has also been a practice to take birds by a decoy bird of their species, whence they were entrapped in nets. *Poachers*, also, use nets and gins for destruction of the game.

Hunting is now, and always has been, accompanied with music of various descriptions. It is regarded as one of the best of exercises, and the most conducive to health, which can be followed, as well from the exercise of the body and mind, as the great variety of free and wholesome air which is inhaled; and also from the mind being constantly employed in expectation of the event of the pursuit.

SECOND PERIOD.—*Pasturage.*—The second epocha of human society's existence was supported by that nutriment to be drawn from the produce of flocks and herds; we have abundant proof of this from numerous circumstances mentioned in the Pentateuch; among others, let the instance of the separation of Abraham and Lot be taken into consideration:—why did they separate? because there was not room for *all their cattle*; and the herdsmen of Abram and those of Lot disagreed, and this misunderstanding between the servants, in some degree affected their masters. “And Abram said unto Lot, Let there be no strife, I pray thee, between me and thee, and between my herdsmen and thy herdsmen; for we be brethren. Is not the whole land before thee? Separate thyself, I pray thee, from me: If thou wilt take the left hand, then I will go to the right; or if thou depart to the righthand, then I will go to the left. And Lot lifted up his eyes, and beheld all the plain of Jordan, that it was well watered every where, before the **LORD** destroyed Sodom and Gomorrah; even as the garden of the **LORD**, like the land of Egypt, as thou comest unto Zoar. Then Lot chose him all the plain of Jordan; and Lot journeyed east; and they separated themselves one from the other. And Abram dwelled in the land of Canaan, and Lot dwelled in the cities of the plain, and pitched his tent towards Sodom.”⁸

Their flocks and herds, in those days, furnished the people with food and clothing; and in the cultivation and care of these, they lived in that sweet simplicity, denominated, by way of eminence, the **GOLDEN AGE**, which is so beautifully described in the writings of the best pastoral poets: at the head of whom appear the *Syracusian*, *Theocritus*, and the *Roman*, *Virgil*. Of modern authors, none are considered more beautiful than *Shenstone*, *Thomson*, *Gesner*, and *Bloomfield*; *Allan Ramsay's Gentle Shepherd* is also entitled to much admiration.

It has been, with truth and elegance, observed by an elegant writer,⁹ “That pastoral subjects are admirably calcu-

⁸ Genesis, xiii. 8, 9, 10, 11, 12.

⁹ Dr. Blair's Essay on Rhetoric, &c.

“ lated for presenting rural imagery, and those scenes we
 “ usually associate with innocence, simplicity, and virtue;
 “ —to communicate consolation to the mind perturbed by
 “ care, and by the active bustle of life;—by bringing to
 “ recollection those scenes associated with our earliest im-
 “ pressions, when *all* was serenity and guiltless joy.”

Pasturage is so closely connected with *Agriculture* in the present practice, that it will be further noticed in that article.

THIRD PERIOD.—*Agriculture*.—The *third* epocha of human existence we apprehend to have been sustained chiefly by the occupation of agriculture. Although to a transient observer, it may appear, or we might have assumed it, as taking our authority from the *Scriptures*; we must see that it constituted the first employ of the species; because, he would say, that *GOD* sent the first man to *till* the ground, having previously informed him, in consequence of his transgression, that the earth should produce thorns and thistles, and that in the sweat of his face he should earn his bread.¹⁰ But to a person who should argue thus to support his position, as suggested, we reply, that he has forgotten to take into consideration the *Omnipresence* of the *SUPREME*, to whom the past, present, and future, are, with him, as the same instant. The threatened malediction, we, therefore, humbly contend, had, perhaps, a reference to future as well as to the present; and also that it was not meant to apply solely to the individual person of *Adam*, but was also to be attached to his posterity. However, as it would from thence appear, that the divine Author of Nature even condescended to instruct man, in affairs of difficulty, how to act, it is extremely probable that he was taught in a thing of so much importance to him, as was the method to procure food.

Taking up this question, upon the relation of human historians, and judging of what *might* have ensued, had man been taught by experience alone;—in that case, we might then have viewed it by the same medium through which our mind is impressed by the relation of *Diodorus Siculus*, instead of that in which it is previously given. In that case, indeed, a relation more consonant to natural probability could not have been discovered than his. He says, but it will be remembered he spoke of a *post-diluvian* period, that so sanguinary had been the habits of men, that they killed and even ate one another. This must have been understood, *we should think*, when other animals could not have been found. “ And that it was owing to the care and industry of *ISIS*,

who collected the wheat and barley she found growing here and there wild in the fields, among other herbs and weeds ; of this she taught her people how to make bread, which they found so sweet and delicious, and so much good did this discovery produce, that it made many leave off their barbarous course of life ; whilst others, the most refractory, she restrained by fear and dread of punishment." This Egyptian *Isis* is by some said to be the same person with the Grecian *Ceres* ; and *Themophorus*, or the legislatress ; and with קֶרֶת, *Ceretz* or *Cerets*, rendered *comparitio excidium*, i. e. overthrow, or turning topsy-turvy : *Jeremiah*, xlvi. 2, alluding to the destruction produced by the general deluge. She was feigned to have been the daughter of *Saturn*, or the most ancient, and *Rhea* or *Ops*, which is darkness. She mourned her lost daughter Περιφαττα, abundance lost ; and Περσεφονε, or Πρωσερπινε, the lost corn.¹¹

Osiris, the husband and brother of *Isis*, taught his people, with the assistance of a minister, named *Triptolemus*, from a word in the oriental languages, derived from תְּרִפָּה, *trap*, a furrow, and תְּלִם, *tolem*, a turner, or breaker of the furrows, how to till the land, to cultivate, gather, and preserve the corn.¹² "Osiris also instructed them in the gathering and preservation of the fruits of the earth ; to plant vines, make wine, and where vines would not grow, he discovered the way to make a liquor, little inferior to wine in flavour, from barley, called, in the language of Egypt, "ZYTHEN," which we understand by the familiar terms of beer and ale.

The historian adds, "that, for an evidence of this first finding of the use of fruits, &c. they alleged an ancient custom among them. At this day, in the time of harvest, the inhabitants offer the first fruits of the ears of corn, &c. mourning about the handfuls they offer, and invoking the goddess *Isis* : and this they do in return of due honour for that invention at the first. In some cities also, when they celebrate the feast of *Isis* in a pompous procession,¹³ they carry about vessels of wheat and barley, in memory of the first invention by the care and industry of this goddess." He likewise subjoins, "In the time of *Osiris* and *Isis*, projectors and ingenious artists were in great honour and esteem ; and, therefore, in *Thebes*,

¹¹ *Vide l'Abbe Fluche, Historie du Ciel.*

¹² *Ibidem.*

¹³ On the first *Neomenia*, or New Moon, after the appearance of the Dog Star, in the northern hemisphere, was the feast of this goddess celebrated. *Diodorus Siculus*. See also to this fact, *Hale's Analysis of Chronology*.

“ there were then goldsmiths and brasiers, who made weapons for the killing of wild beasts, and other instruments for the husbanding of the ground, and improvement of tillage.”

Agriculture, in its most general sense, explains the art of cultivating and improving the earth, so as to render it *most productive*. In this view it comprises the nature of climate, soil, &c.; the methods of performing the various operations requisite thereto: as enclosing lands, making hedges and mounds of various materials, denominated according to their nature; and the draining, paring, burning, watering, warping, fallowing, ploughing, sowing, harrowing, moulding, and hoeing;—encouraging the growth and concerning the preservation of all kinds of corn, grain, hay; and the management of pastures, meadows, woods; all arable and grass lands; the raising of all kinds of seeds, as rape, mustard, flax, hemp, clover, and all grass seeds; the rotation of crops, fallows, making swards, and other usual economy.

In the most extensive sense, it includes the breeding, rearing, feeding, and general management of all kinds of cattle and live stock; as horned cattle, horses, sheep, lambs, hogs, rabbits, poultry, pigeons, bees, &c. and the conducting of the various processes, and other the preparations which relate to the different products procured from them, as milk, butter, cheese, or dairy management; fleeces, hides, wool, hair, horns, &c. which are commercial. Next, it concerns the practice of agricultural architecture, as the building of houses, sheds, stables, and other erections for those purposes; mills, machinery, &c. And, lastly, as it is connected with political economy, so far as relates to the construction of roads, canals, embankments, and the statistical regulation for weights, measures, &c.

Gardening and horticulture is, also, an improved species of a branch of agriculture; which several kinds of agricultural improvement have been, from time to time, improved; but as no definite period can be marked, the previous general specification may suffice.

Our species were soon convinced of the practical utility of cultivating this art, as we have seen. In the first stage of society the practice of hunting was a dangerous occupation, and the result uncertain, and but ill calculated to supply the constant and daily wants of man. Pasturage, the next process, was likewise attended with uncertainty, from blains, murrain, and various epidemical diseases to which cattle are liable, equally productive of uncertainty.

Therefore, the next occupation for the species, and which promised a greater degree of *certainty*, occurred in the practice of agriculture.

Acting upon this principle, we find man has, in all ages and every nation, been attentive to the cultivation of the soil, to furnish the species with necessary sustenance. Accordingly, we have seen it was practised in *Chaldæa*, *Phœnicia*, *Egypt*, *Syria*, and most eastern nations, in the earliest times; by the *Greeks*, *Romans*, *Etrurians*, *Carthaginians*, *Teutonians*, and various other people in the middle ages; and by every nation of Europeans in later periods. So that, at the present moment, there is no art or science whatever which has arisen to a greater degree of perfection.

Machines for reducing Corn.—After the first cultivation of corn, it is evidently apparent its use must have been soon known by humanity. The means which have been since discovered were first, it is probable, the same as the modern Arabs, (who differ but little from the ancient in customs, &c.) in the interior of that country, at present practise; which is, first, to saturate the corn in water, and then to grind it into a paste between two stones. *Niebuhr* saw the machine, consisting of an under stone, hollowed out, and intersected with notches or indentions, and an upper stone of a cylindrical shape, but differing from a regular cylinder, inasmuch as in the centre it was largest;—this was also notched or indented. The corn being prepared, as above-mentioned, was put into the receiving stone; then the upper stone was rolled forwards and backwards, till it became paste; the paste so formed was then spread into thin cakes, dried in the sun, or baked over a fire.

But then we are told that *Abram*, on the entertainment of his heavenly guests, made cakes of fine meal, which must have been prepared by a contrary process to the Arabian method, and was, doubtless, formed by the same mode as our colour-grinders now employ, by a species of mortar, called *meta*. See a subsequent article.

The Discovery of FIRE.—The introduction of this element, to be subservient to the purposes of man, was assuredly of ancient times. Accordingly, we find it was claimed by **VULCAN**, who is reported to have been an Egyptian prince, and is said to have been made upon the following occasion, as related by *Diodorus*.

“ There are some priests who affirm Vulcan to have
“ been the first of their kings; and that he was advanced
“ to that dignity upon account of being the first that found
“ out the use of fire, which was beneficial to all mankind.

“ For a tree in the mountains happening to be set on fire “ by lightning, the wood next adjoining was presently in “ a flame ; and Vulcan, thereupon, coming to the place, “ was mightily refreshed by the heat of it, being then win- “ ter season ; and when the fire began to fail, he added “ more combustible matter to it, and, by that means pre- “ serving it, called in other men to enjoy the benefit of “ that which he himself was the first inventor, as he gave out.”

Diodorus delivers this, we observe, with the precaution that should distinguish an historian in his inquiries after truth,—as he himself received it. Be it as it may, that the Egyptians knew the use of fire four thousand years ago, there can be no doubt in our mind ; for we ourselves have ascertained the date of an hieroglyphical inscription of that people to be three thousand five hundred and ninety-seven years old, whereon is its symbol. They also, in the earliest ages, were extremely expert in the cutting, carving, and engraving of emeralds, the native produce of this country, and other precious stones, as *marbles*, *porphyry*, *brechia*, *bysalt*, *granite*, &c. of the hardest texture ; for which purpose iron or steel with diamond powder are now necessary.

Although the Pentateuch is silent as to its first introduction, yet by inference we must presume that it had an early existence,—even so remote as the days of Adam : for how could the ground be tilled without the proper materials ?—to have which, fire was an essential preliminary. Cain, also, tilled the ground as an occupation : he, moreover, built a city, which would have been impossible without the assistance of fire. *Jubal* was a musician ; the instruments he used could not have been formed without its aid. His son, *Tubal-Cain*, was an artificer in metals. Hence, its introduction must have been anterior to those circumstances. In all kinds of ancient religious service, among Hebrews and Gentiles, fire constituted a *ceremonial* part of the *worship*. It was a proper type of the godhead, from its *purity*.

In Persia, also, the established religion of the country was the *actual worship* of this element, as a divinity. The worshippers were called *Guebres*, or *Gaurs*, of whom the arch-guebre, or first high priest, was the celebrated *Zoroaster* ; since whose days, the kings of Persia have been initiated in the high office previous to coronation.

This is one of the *five* pure elemental compounds, which is commixed in some degree or other with every constitutional part of nature. Modern discoveries in *Pneumatics* have informed us, that things consumed in fire are so decomposed by the force of the active particles of flame,

which is defined to consist in the consumption of pure *oxygen gas*; for without a proper supply of that element, no ignition can take place. We have been repeatedly witness to experiments in this science, when we have seen iron consumed with the same rapidity as though it were a resinous substance.

METULLERGY.—We speak of the origin of this art precisely under the same circumstances in which we discussed the last article: but that its discovery must have been nearly coeval with the discovery of fire we have little reason to doubt. By inference, this is most evident; as neither could metals have been dispensed with for almost every purpose of human life; or could human existence have been rendered secure without the assistance of the ignititious and metallic elements. The social compact could not have been formed or at least not preserved, without them. Cities could not have been built, or the most common necessities supplied, without their aid. Of metals the species are most various; but nearly all are discovered by the agency of fire. The more valuable are the most *scarce*, most *dense*, and most *ductile*; among which are classed silver and gold. But the most invaluable are such as are easiest procured; iron, for instance, with copper, tin, and lead.

Mineralogists have classed the varieties of metals, and estimated their intrinsic value by many standards. Some are semi-metals, some in a liquid state, and others mixed with some different metal; but semi-metals, from alliance, are found to be nearly analogous, in many of their properties, with the metal in the vicinity of which they are discovered.

The modern *Metullergists* thus arrange the various metals now discovered to exist, which, with the various degrees of heat necessary to fuse them, according to Wedgwood's Pyrometer are as follow:

Chym. Char.	Name.	Degree.	Chym. Char.	Name.	Degree.
2	Tin	447°	8	Cobalt	17977°
8	Bismuth	476	♂	Cast Iron	17977
2	Lead	612	8	Nickel	20577
♀	Mercury boils..	660	♂	Wrought Iron..	21637
0	Zinc	700	♂	Maganese	21877
♂	Antimony	809	♂	Platina	23177
♀	Brass	3507	*Tringelen	23177	
♀	Copper	4587	*Molybdenum ..	23177	
D	Silver	4767	*Titanium	23177	
0	Gold	5237	*Uranium.....	28177	

* The metals distinguished by asterisks have their chymical characters expressed by the initial letter of each name surrounded by a circle.

ARCHITECTURE—is a science most beneficial to humanity. It is very evident that it must have had an extremely ancient original. The origin of this art is presumed to have been imitated by man from those natural caves and recesses which are discovered in various parts of the earth. For in those, it is reported, the first men took shelter, in Greece, from the inclemency of elemental strife, and to avoid the piercing contingencies of ultimate and precarious uncertainty. The oldest buildings in the world are, accordingly, said to be beneath the surface of the earth; among which are reckoned the famous temple of *Elephanta*, in the Delta of the Ganges; the *Catacombs*, in Egypt; and, upon the surface of the earth, the tower of *Belus*, at *Babylon*; *Chaldemar*, in *Persia*; the *Egyptian Mausoleum*; the **Druidical Temples** in *Gaul* and *Britain*.

Among the various arts cultivated in society, some are only adapted to supply our natural wants, or assist our infirmities; some are mere instruments of luxury, calculated to flatter pride, gratify vanity, and to satisfy our desires of every description; whilst others tend at once to secure, to accommodate, delight, and give consequence to the human species. Architecture is said to be of this latter kind, in unison with the former; and if viewed in its full extent, may be truly said to possess a very considerable portion not only of the comforts, but the conveniences, the positive utilities, and many of the luxuries of life. The advantages derived from **HOUSES** *only* are very great, being the first step towards civilization; having great influence both on the body and the mind of man. Secluded from each other in woods, caves, and wretched huts, the inhabitants of such recesses are generally found to be men, indolent, dull, inactive, and abject; their faculties benumbed, their views limited to the gratification of their individual and most pressing wants. But when societies are formed, and commodious dwellings provided, where, well-sheltered, they may breathe a temperate air amid summer's heat, and winter's cold; sleep, when nature requires, at ease and in security; study unmolested; converse and taste the sweets of social enjoyments;—they are spirited, active, ingenious, and enterprising, vigorous in body and active in mind. If benefits like the previously enumerated result from any art, then will that of the architect be found to claim a decided pre-eminence.—When we reflect on the almost infinity of useful purposes to which this art is conducive;—that it erects us temples for sacred worship, domestic habitations, where ease, grandeur, elegance, and simplicity, are agreeably combined;—that it is conducive

to our safety, comfort, and convenience in uniting different districts of country by the facility of bridges, roads, &c.; is contributive to the gratification of our natural wants, by raising aqueducts; to our safety, in building walls to towns, prisons for the most depraved, vicious, and abandoned, receptacles for the most wretched and unfortunate;—we should be grateful for this divine art!

As the inhabitants of a commercial country, the benefits we derive from *naval* architecture are incalculably great; when we reflect that it operates as a medium of communication between us, an insulated people, and the whole earth, in its most distant colonies; that it serves to convey between our people and all nations the native produce of the respective countries, with the effects of mutual industry; that it clothes, feeds, and furnishes sustenance to thousands; and, in a *national* point of view, our royal navy is the wonder of a world!—which affords us every protection when all other hopes fail! What ever can surpass its utility in the latter point of view?—what can exceed its assistance? By the criterions previously mentioned let us determine. We shall find that, of all arts the world has ever boasted, there is none its superior.

There are no other designs, whether necessary or superfluous, so certainly productive of their desired object, so beneficial in consequences, or so permanent in their effects, - as is the art of the architect. Most other inventions which afford pleasure and satisfaction soon decay; their fashion fluctuates, their value is lost: but the productions of architecture command general attention, and are lasting monuments, beyond the reach of ephemeral modes: they proclaim to distant ages the consequence, genius, virtues, achievements, and munificence of those they commemorate to the latest posterity. The most obvious and immediate advantages of building are, the employment of numerous ingenious artificers, industrious workmen, and labourers of all kinds; converting materials of small value into the most noble productions, beautifying countries, multiplying the comforts and conveniences of life. But not the least desirable effects of the architect's art, perhaps, yet remain to be noticed, in affording to the numerous train of arts and manufactures concerned to furnish and adorn the works of architecture, which employs thousands, constituting many valuable branches of commerce. Also from that certain concourse of strangers to every country celebrated for stately structures, who extend your fame into other countries, adopt your fashions, give reputation and create a demand for

your productions in foreign parts: these are circumstances which certainly should not be too lightly valued, and these circumstances result from architecture. At this day the ruins of ancient Rome support the splendour of the modern city, by inviting travellers, who flock from all nations to witness those majestic remains of former grandeur. The same may be said of many other countries famous for architectural remains. Thus architecture, by supplying men with commodious habitations, procures that health of body and energy of mind, which facilitates the invention of arts: when, by the exertion of their skill and industry, productions multiply beyond domestic demand, she furnishes the means of transporting them to foreign markets: whenever, by commerce, they acquire wealth, she points the way to employ their riches rationally, nobly, and benevolently, in methods honourable and useful to themselves, and beneficial to *posterity*, which add splendour to the state, and yield benefit to their descendants. She further teaches them to defend their possessions, to secure their liberties and lives from attempts of lawless violence or unrestrained ambition. So variously conducive to human happiness is this art, to the wealth and safety of nations,—so naturally does it demand that protection and encouragement which has ever been yielded it in all well-governed states.

The perfection of various other arts we have beheld to be a consequence of this; for when building is encouraged, painting, sculpture, and every species of decorative art, will flourish of course. It should not however be imagined that the heaping stone upon stone can be of consequence, or reflect honour on individuals or nations: the practice of architecture infers exquisite art to be an essential preliminary; without this, and having some laudable end in view, it is apt to raise disgust. Architecture is usually divided into CIVIL, MILITARY, and NAVAL, *architecture*.

In the first attempts of architecture it was extremely rude, if we believe those ancient historians, *Diodorus*, *Herodotus*, and *Tacitus*: we have not room to give even a sketch of their descriptions, but must refer to their several works. It has, however, from time to time, as improvements have advanced, been raised to relative importance as the *intellection* of the people have improved. And it certainly gives the best record of the mental progress of every people which can be collected. It has ever been found to flourish best in free states, and when the governors have possessed genius, virtue, and good taste. The most eminent æra of Grecian architecture was when the Athenian

republic was under the direction of *Pericles*: at this period also existed the first of statuaries, *Praxiteles*. Where that eminent artist and their admirable architects were employed, in the words of *Pausanias*, “they rendered the whole of *Acropolis* as an entire ornament.” There are various characteristic distinctions to be made in the several orders of architecture which distinguish the Grecian people: the *Doric* is eminent for primæval simplicity; the *Tuscan* embraces more ornament; the *Ionic* unites simplicity and elegance; but the sum of all excellence appears to be united in the *Corinthian*: the *Composite* is also a most elegant order, but appears to have added but little to the Corinthian elegance and majesty. Various nations have a great diversity of architecture; as the Egyptian, Persian (distinguished by human figures supporting entablatures,) Hindostanee, Arabasque or Morisquo, which are very peculiar, generally having the walls to project most at the top, which is indicative of the natural jealousy of all oriental people; they all regarding their *women* as their chief treasure, it appears meant for their especial preservation.

A greater simplicity does not appear any where than in the architecture of the Druids, consisting of most extensive circles of immense stones, chiefly raised perpendicular with occasionally a larger single stone placed upon the apex of two others horizontally. There are in Britain numerous of the remains of these constructions, the chief are *Stonehenge*, near *Salisbury*; at *Avebury*, also, in *Wiltshire*; *Pomona*, in the *Orkneys*; *Rollright*, in *Oxfordshire*: but the most eminent spot for Druid temples was *Mona*, or *Anglesey*, in Wales. The reason for such apparently unmeaning erections will be found in their peculiar belief, in the religion they professed.

The *Saxon* is a very heavy order of architecture: it was used in this kingdom much in the erection of religious edifices, and is frequently found mixed with the *Norman* in such structures. The grand and most obvious distinction is a semicircular arch, with massy columns variously ornamented, and most frequently the columns which support the same arch are diversely sculptured. The chief structures of the kind in this kingdom are Gloucester Cathedral; Malmesbury Abbey, Wilts; some more cathedrals; Ledbury Church, Herefordshire; several churches in Rutland, Lincoln, Somerset, Devon, and other counties.

There appears to us to be no order of architecture better calculated for the purpose to which it is generally adopted than the chaste and pure *Norman* style, barbarously denominated *Gothic*: it affords a great variety of light airy beauty, and

tasteful grandeur. Witness the elegant and highly ornamented pile of Westminster Abbey; Tintern Abbey, in Monmouthshire; and many other eminent ecclesiastical buildings, as Lincoln, Salisbury, and other cathedrals.

In this country the Norman order succeeded the Saxon, and we lost nothing by the exchange: for even now we have the entire benefit of a choice of the purest Grecian, (since its revival by *Inigo Jones*;) it is a matter of taste to be certain; but, in our own individual estimation, the chaste Norman is to be preferred to the purest Grecian for the purposes for which it is intended; and if the means answer the ultimate end, we submit this to be the *just* criterion for preference. We find it usually employed in religious edifices; it is pure, light, airy, and cheerful: we submit that the service of gratitude and thanks to the Creator demands a disposition of mind which these feelings are best calculated to inspire.

Domestic architecture is various, and chiefly regulated by the various purposes for which it is designed: its characteristic is utility. The names of the chief architects on record, in the latter ages, are *Vitruvius*, *Palladio*, *Scamozzi*, *Serlio*, *Vignola*, *Borboom Cataneo*, *Alberti*, *Viola*, *Inigo Jones*, *De Lorme*, *Perault*, *S. Le Clerc*, *Sir Christopher Wren*, and the *Earl of Burlington*.

Vitruvius enumerates twelve requisite qualifications for an architect: that he be docile and ingenious, well educated, skilled in designing, in geometry, arithmetic, history, philosophy, music, medicine, law, and astronomy: he should also possess exquisite judgment and taste.

GOVERNMENT.

Civil government was called by the Egyptians *Harpo-cates*, which they typified by the figure of a man holding the fore-finger of his right hand upon his mouth. Considering that there must have existed some motive for its origin, the comforts of society, it seems that this figure could not have been thought irrelevant, or improper to excite it, by some motive equally ostensible. Here is, first, the necessity for congregated men obeying authority, and submitting to be regulated by *laws* agreed upon, this must also be apparent; the wisdom of this hieroglyphical figure of silence will hence be obvious. Thence laws at first proceeded from the necessity of the institution: their observance was essential, not only to individual protection and general prosperity, but also to the very existence of the associated community.

The principles on which associated communities are formed first arose from individual weakness, and consequently associated members uniting for mutual protection, convenience, and security. Consistent with those views, LAWS are of necessity to be taken into consideration; the objects of which, in wisely governed communities, were to prevent wrong, preserve right, protect innocence, and punish guilt: hence we see the end of law is calculated for mutual security, individual and general preservation, and to promote equal justice among those to be governed.

All governments presume a head, with necessary subordination and respectful obedience on the part of their people to the governors.

The governments of early times were characterized by patriarchal simplicity, *similar* to the direction of the parent or master of a family.—The people who were governed were also generally stimulated by a similar docility to what is observed in families, where the head is an object of love as well as of veneration.—Of the authority of the heads of large and opulent families we have an example in *Job*, c. xxix. v. 7, 8, 9, 10. “When I went out to the “gate through the city, when I prepared my seat in the “street! The young men saw me, and hid themselves; and “the aged arose and stood up. The princes refrained “talking, *and laid their hand upon their mouth*. The nobles “held their peace, and their tongue cleaved to the roof “of their mouth.”

Government, properly speaking, as to be now understood, is distinguished into *general* or supreme, as that of an empire, kingdom, or sovereign state; or it is *particular*, being subordinate or delegated, as of an inferior kingdom, province, or city: as the King of England governs Ireland by an officer, styled a *Lord Lieutenant*; has also officers in each county denominated Lieutenants, the Provost of Edinburgh, Wardens of the Cinque Ports, &c. The Calif of the Saracen empire deputed *Shaddâd Ebn Aus* his representative at Damascus, when that celebrated city, with all Syria and the eastern empire, bowed to the Mahomedan crescent.¹⁴

Government may be again distinguished into civil, military, and ecclesiastical: also for the precise form of government, for its general police, or particular regulation. In this view the various forms of government have generally received their denomination; which is produced by the number

¹⁴ Alwakidi, A.D. 635. Hegira, 14.

of persons to whom the government is entrusted. If the power is concentrated in one person, without any restraint, or not controllable by any law or obligation, but where the movements of the state are directed by his supreme will, it is called *despotic*; which governments originate from military power, or from submission in the people, or from their extreme affection to some virtuous individual. Where the government is lodged in the hands of a sovereign, who governs by fixed and certain laws, or has associated with him other branches of the state to direct, remonstrate, or assist, it is called a *limited* monarchy, in its several degrees. Where the government be lodged with a limited number, it is called *oligarchic*, or *aristocratic*: and if all its members have a vote or voice in its legislation, councils, &c. it is termed *democratic*.

Civil government, as has been suggested, originated first in patriarchal simplicity; monarchical government, in the wants and fears of the people: convenience, profit, habit, and numerous advantages, still connect civil societies. Individuals, originally naturally free, and in a primitive state equal, though, at one period independent, have, for the mutual preservation of their lives, liberties, and existence, by express or implied consent, associated together; and thus resigned their original liberties, upon the general and original principle, that every and all its component parts should be protected by the whole. Notwithstanding, however, the several governments which now exist, had in the first a being, there is, and must be in all of them, a supreme head, to whom the others must submit, or anarchy, division, and destruction must ensue.

Considering that the original of all governments, in the first, emanated from the individuals themselves who associated, the tendency of the measures of such government should be directed for the general good of the people who are its subjects. When this general principle is neglected by rulers, such government is recreant, and apostate to its original compact.—That form of government is the best adapted to the welfare of its people, where each state has a voice in its direction, so nicely equipoised that the pressure of ascendancy in neither is felt to the injury of its functions. Such appears to have been the ancient government of the *Germanic* small states, though of a military character; whence our Saxon ancestors brought the principle to the shores of Britain. Such was the government admired by *Tacitus* in those states, but by the historian thought incompatible with extended monarchies; and such was the

government previously eulogized by the accomplished judgment of *Cicero* in those words: “ *Esse optimam constitutam republicam, quæ ex tribus generibus illis, regali optimo et populari sit modici confusa.* ”

Such appears to have been the sum of the opinions delivered by the philosophic *Locke*, on Government, b. ii. and also the idea of the learned Judge *Blackstone*, *Com. v. 1. Introduction.* See also in the *next article.*

On Regal Government.—Since kings are spoken of in the very earliest periods, in the first part of the most ancient writings we possess in Europe, it is presumed that the regal office must have existed in the very earliest periods of society.—There are two plausible and fertile sources for this supremacy of one man over his fellows, and whence it probably had existence: first, in the patriarchal authority of an extensive and opulent family; second, in that attachment which warriors bear to a successful leader.—In the first then it appears this high office bore a near affinity to patriarchal or parental simplicity, which then distinguished the fathers of families, whose chief characteristic was *care* for their people. In this it varied from modern European conception, inasmuch as Europeans appear to differ from the early simplicity of the primitive Asiatic world.

Our acquaintance with oriental customs enables us to state, that in Asiatic districts the success or good fortune of a leader *has been* taken constantly as the measure of his merit;¹⁵ therefore a *fortunate* leader stood a very good chance so far to secure the affections of his hardy soldiers, as to obtain the supremacy over them: they consequently resigned their native freedom to his keeping.

We have early instances in the first book of the Mosaical law, to cite which will illustrate both these positions: the first appears in the character of *Abram*, and the second in that of *Nimrod*. For further testimony, should such be wanting, we refer the reader to the second volume of the *Moral Philosophy* of Dr. Paley, who discusses this article at considerable length. And although the erudite Doctor differs from our conception in some few slight particulars, yet on the whole our views form an unison.

Original Principles on which the Office had Existence.—It appears that subsequent to parental authority constituting this high office, that it was in ancient days *elective*; when the surest pledge of success, which an individual could possess, seems to have been the highest degree of public

¹⁵ *Alwakidi*, Arabic MSS. *Laud. Bodl. Bibl. Oxon.*

spirit evinced for the general welfare; in the greatest measure possible of his exertions to serve the people, whom he was laudably ambitious to govern. However, this appears to have been the principle on which the first monarch named in the Israelitish history obtained the suffrage of his people. There we are told that “**NIMROD** was a mighty “ one on the earth, and that he was a mighty hunter before “ the **LORD**. The beginning of his kingdom was *Babel*, and “ *Erech*, and *Accad*, and *Calneh*, in the land of *Shinar*.” *Gen. x. 8, 9, 10.*

Now his hunting, it should appear,—(but that these circumstances are not mentioned, because the writers rather too often put a part only for the whole, which circumstance renders their meaning often obscure to the turgid imaginations of Europeans, entirely strangers to their modes of life, and their highly figurative expressions; also the sacred records were written for other purposes than mere historical research.)—But from what little is said of Nimrod, we can readily collect that his hunting did not in the least resemble the exercise now known in Britain bearing the same denomination. (But, upon that subject, *vide* the article **CHASE**.) Suffice it, for the present, to say, he had secured to himself the gratitude of his people. Yet, let it be added, that in those days the earth was grievously infested with ferocious animals, and with fierce and savage men; both of whom were intolerable annoyances to the peaceably disposed of humanity, and to their domesticated animals. Therefore the chase and destruction of savage animals first devolved upon the noble, spirited, courageous, and generous-minded of our species; with great personal risk, and frequently to the destruction of the individuals themselves.

The season for hunting those animals usually commenced about, or a little after, the autumnal equinox. The land being freed from them, the chase for murderers, robbers, and other miscreants, began. Now we are to view the character under consideration as **SUCCESSFUL** in both respects: he was, therefore, from gratitude in the people, advanced to the regal dignity. Likewise, as in part embracing the former proposition, and taking in one proposed, at length, by Dr. Paley. “ There “ might have existed that respectful and grateful veneration “ for the memory of the grandfather of Nimrod, the antedilu-“ vian **NOAH**, who unquestionably was most entitled to their “ veneration, not only from his being the common parent of “ all then living, but also, because from him they received “ those blessings they then enjoyed of the produce of the earth, “ and those arts which would render their existence less dis-

“ tressing. Therefore, as well on the ground of *personal merit* as on that of *noble descent*, he seems to claim the suffrage of his people.” We have likewise afforded us, from the same history, another light on this subject; for, in the fourteenth chapter of the same book, we are informed, that *Amraphel* king of Shinar, *Arioch* king of Ellasar, *Chedorlaomer* king of Elam, and *Tidal* king of nations, made war with the kings of Sodom and Gomorrah, *Bera* and *Birsha*, *Shinab* king of Admah, and *Shemeber* king of Zeboiim, and the king of Bela, which is *Zoar*. These latter kings are presumed to have been tributary to the king of Elam; for we read that they had served him for twelve years, and in the thirteenth year they rebelled. From this mode of ancient policy, we may judge that those kings, like the petty princes of ancient *Teutonia* and other German states, of Gaul and Britain, governed each his own clan, district, or family circle, called tribes; but were answerable to a superior lord: for, that as *Tidal* was called “ king of nations,” so, it appears, that *Chedorlaomer* received sovereignty or service from the five other princes; that is, he was the *dux et princeps*, or chief of those kings, which eminency might have arisen from various circumstances, at present unknown. Also, we observe, this was the case in the heroic ages of Greece; at a much later period, to be sure, but they are of sufficient antiquity for the present purpose. And it is here we see the character of priest and king was united: there is not a sacrifice in *Homer*, but the chief monarch assisted in its performance. The same was *Melchisedeck*, also, a prince and priest of the most high God. So also we observe in Egypt the princes were always first invested with the sacred office of priest; indeed it was an essential preliminary there to the regal office. In Persia, also, from the time of *Darius Hydaspes*, the princes of that country were also priests to the God of Day; from a law being expressly made by that prince. These circumstances are just mentioned, to show the vast addition of power which it threw into the hands of a king; that addition giving him sovereignty over their minds, as his regal title gave him dominion over their persons and property: and they are mentioned, to show how closely the temporal and spiritual power have always preserved their union. *Agamemnon*, king of Argos, was the *dux et princeps* of the confederate states of Greece against Troy; in consequence, he has the epithet ‘ *king of kings*,’ a title analogous to ‘ *king of nations*.’

As to the *mode of election*, we find it definitely mentioned in the History of Egypt, by *Diodorus*. “ *The priests, in-*

"deed, do make HERMES (*the same with Mercury*) the inventor of all arts and sciences; but say, that their kings found out all things necessary for the support of men's lives: and, therefore, that kingdoms were anciently not inheritable, but given to such as had been most USEFUL to the people thereby either to induce the kings to be kind and benevolent to all their subjects, or for that (as was most agreeable to truth) it was a law registered in their sacred records, commanding them to do so."—Diod. Sic. 2d part of lib. i. ch. 4.

This elective franchise in the people, Dr. Paley says, originates in the following manner:—He presumes all governments to have originated on the previously stated principles.—"The first form," he says, "was that of a parent over his young children; then, the second, that of an ancestor presiding over his adult descendants." The association, thus formed, would naturally be continued after the death of the original progenitor; and the members of it, accustomed to the benefits resulting from it, might be induced to supply his place by a formal choice of a successor; or they might voluntarily and almost imperceptibly transfer their obedience to one of the family, *who* had claimed their respect and confidence; or, again, they might receive with due deference a successor appointed by the first. Thus we have the tribe or clan incorporated under one chief, and fulfilling the purposes of civil union, without any other or more regular convention, constitution, or form of government, than what has been now described. Two or three of these clans would frequently, by marriage, conquest, *or* mutual defence, *in* common distress, or from some other accidental circumstances, be united into a society of larger extent."

The principles that learned author ascribes to popular obedience, are as follow:—1st. Those who obey from prejudice, or who are determined by an opinion of *right* in the governors, which opinion is founded upon *prescription*: this prescriptive title, in hereditary monarchies, is corroborated, and its influence considerably augmented, by an accession of religious sentiments, and by that sacredness which men are apt to ascribe to the persons of princes.—2d. Those who obey from reason, by a consideration of the necessity of some government or other, and of the certain mischief of civil commotions.—3d. Those who obey from self-interest, and who are kept in order by a variety of considerations that immediately affect themselves. The Doctor disclaims the idea of the existence of what some have denominated,

and so hardly insisted upon, called the *social compact*, which is imagined to exist between a prince and his subjects; and, instead thereof, resolves the principle of obedience in the people to the **WILL OF GOD**, made manifest by, and collected from expediency, established on the following principles:—It is the will of God that the happiness of human life be promoted. Civil society conduces to that end:—civil societies cannot be upheld, unless in each the interest of the whole society be binding upon every part of it; which state of the argument leads to its immediate conclusion, *i. e.* so long as the interest of the whole society requires it, or so long as the established government cannot be resisted or changed without public inconvenience, it is the *will of God* (which **WILL** universally determines our duty) that the established government be obeyed, and no longer. The justice of which principle, being admitted, the equity of every particular case of resistance is reduced to a computation of the quantity of the danger and grievance on the one side, and of the probability of success, and the expense of redressing it, on the other. If it be asked, Who shall judge of this? The answer is, “*Every man for himself.*”—In contentions between the sovereign and subject, the parties acknowledge no common arbitrator; and it would be absurd to refer the decision to *those* whose conduct has provoked the question, and whose own interest, authority, and fate, are immediately concerned in it. From the substitution of “*public expediency*” into the place of all implied compacts, promises, or conventions, whatsoever, our author infers, 1st. That it may be as much a duty at one time to resist government, as at another period to obey it: *viz.* when more advantage will, in our opinion, accrue to the community from resistance, than mischief. 2d. That the lawfulness of resistance, or the lawfulness of revolt, does not depend alone upon the grievance sustained or found; but also on the probable expense and event of the contest. Hence he justifies the councils of those concerned in the revolution in **England**. 3d. That irregularity in the first foundation of a state, subsequent violence, fraud, or injustice, in getting possession of the supreme power, are not sufficient reasons for resistance, after the government is once peaceably settled. 4th. That resistance is not justifiable by every invasion of the subjects’ rights, or liberty, or of the constitution; by every breach of promise, or of oath; by every stretch of prerogative, abuse of power, or neglect of duty, on the part of the chief magistrate,—unless those crimes draw after them public consequences of sufficient magnitude to outweigh the evils

of civil disturbance. 5th. That no usage, law, or authority, whatever, is so binding, that it need or ought to be continued, when it may be changed with advantage to the community. 6th. All civil obligation being resolved into expediency, it may be asked, What is the difference between the obligation of an Englishman and a Frenchman; or why is the latter bound in conscience to bear any thing from his king, when the former would not be compelled to submit; since the obligation of both is founded on the *same* reason? —Although their *conditions* may differ, their *rights* should seem equal; and yet we are accustomed to speak of the rights, as well as the happiness of a free people,—compared with that which belong to the subjects of an absolute monarchy; and how, it may be reasonably inquired, can this comparison be explained, unless we refer to a difference in the compacts by which they are respectively bound? In order to obviate this difficulty, it is allowed that a Frenchman is in *conscience* bound to endure many things from his prince, which an Englishman would not be compelled to, for the following reasons: *i. e.* because the same act of the prince is not the same grievance, where it is agreeable to the constitution, as where it infringes it; and because redress in the two cases is not equally attainable. The duty of obedience is defined by different boundaries, and the point of justifiable obedience is placed in different parts of the scale of suffering,—all which is sufficiently intelligible without a social compact. 7th. The interest of the whole society is binding on every part of it. If we appeal to the Christian scriptures, with regard to the duty of *civil obedience*, or the *extent* of our civil rights and obligations;—Christianity has left us where she found us: she has neither altered nor ascertained it. The two passages to which writers have generally referred in their investigation of this subject, are Romans, xiii. 1—7, and 1 Peter, ii. 13—18; to comprehend the import of which instructions contained herein, two questions relating to the subject of civil obedience should be considered: *i. e.* whether to obey government be a moral duty and obligation on the conscience of all; and how far, and to what cases that obedience ought to extend. These passages inculcate *the duty*, but do not describe its *extent*. The due consideration of this distinction is sufficient to vindicate these passages of scripture from any explanation of them that shall favour an unlimited passive obedience.—But, admitting that many commentators have stated that an opinion was privately cherished by the first Christians, which led them to conceive that their conversion

to Christianity entitled them to new immunities, to an exemption as of *right* (however they might submit to necessity) from the authority of the Roman sovereign, we are furnished with a still more apt and satisfactory interpretation of the Apostle's words. The two passages apply with great propriety to the refutation of this error. Little need be added in explanation of particular clauses. St. Paul has said, "Whosoever resisteth the power, resisteth the ordinance of God." This phrase, "the ordinance of God," is by many so interpreted, as to authorize the most exalted and superstitious ideas of the regal character. But, surely, such interpreters have sacrificed truth to adulation. For, in the first place, the expression, as used by St. Paul, is just as applicable to one kind of government as to another;—to the elective magistrates of a pure republic, as to an absolute hereditary monarch. In the next place, it is not affirmed of the supreme magistrate exclusively, that *he* is the ordinance of God: the title, whatever it imports, belongs to every inferior officer of the state as much as to the highest. The *divine right* of KINGS is, like the *divine right* of CONSTABLES, in the law of the land, (both coming from the same source, *i.e.* the *people*;) or even actual and quiet possession of their office; a right ratified, we humbly presume, by the divine approbation, so long as obedience to their authority appears to be necessary or conducive to the common welfare. Princes are ordained by God, by virtue of that general decree by which he assents and adds the sanction of *his will* to every law of society which promotes his own purposes, "the communication of human happiness;" according to which idea of their origin and constitution, and without any repugnancy to the words of St. Paul, they are by St. Peter denominated the "*ordinance of man*."

Hence we observe that the chief object of governments is, what it ought to be, THE HAPPINESS OF THE PEOPLE. This certainly appears to be preserving what was, unquestionably, the primitive intention of the human species; and which, also, vests in the people the *right* of election: no such right exists in any, but in them: who, in natural equity, can have any right to interfere in a question of this nature, but those from whom the office emanates? The hereditary right of kings, or that privilege which has been presumptuously arrogated, as a claim from Heaven, of giving their descendants the dominion, be their claim whatever it may for those virtues which should distinguish a prince, or whether their usual conduct does disgrace the character of a man, certainly gave Greece occasion to

designate *all* who bore the regal office *Tυράννος*, for which office, be the person merciful or just who filled it, she had no other epithet in her language.

As the moral character of man has been so radically changed in modern times, from that in which he appeared in the simplicity of nature, so has the kingly office kept an equal pace in what we believe to constitute human degeneracy. Such are styled the *improvements* of society. The result of which is, he exerciseth a dark-minded policy: believing that as, from human care and manual toil, one district of land becomes more valuable than another; as from the cupidity of the species, and an excess of selfishness, one man is induced to covet what may be better than his own; so, guided by this principle, bad kings and ambitious men are desirous of adding a better cultivated country than what they possess to their own dominion. Selfishness in the extreme, and cupidity, are the grand parents of every other vice: these crimes originally introduced error in religious superstition upon the theatre of the world; from thence all other crimes, which have cursed humanity, had their origin. With these originated the dark-minded *Machiavelian* system of crooked policy practised in modern courts: the exercise of which vices produce wars, rapine, private murders, assassinations, famine, pestilence, and the whole train of evils which curse humanity.—On the contrary, just kings and upright counsellors must be also equally well qualified in those evil systems, purposely to meet and controvert the views of wicked governors and evil councillors upon their own terms; or they would be the losers in consequence of their ignorance, not knowing how to avert those advantages which the others would be assiduously alert to seize, and would assuredly take, should opportunity present itself. How dark is this picture, when compared with the illuminated one of a good sovereign, assisted by judicious and humane councillors; their care is to see the people whom they govern happy, and to dispense general peace.

Speaking generally,—the office of a king has, in innumerable instances, ceased to become what it was when superior virtue was the characteristic of recommendation to that august dignity: ever since it became *hereditary* property, have we seen the dynasties decline;—some few instances may be excepted, and which will appear, in most cases, to have been rather the effect of chance, and not from design in the people: now, however, no relative consideration for the virtues of the claimant are introductory to the high dignity.

Office.—The duty of a king appears to consist in the exercise of superior wisdom. He should be skilled in the arts of defence and attack, as a general;—should be able to discriminate character, to know worth of every description, and where to find it;—should be remarkable for sound policy, inflexible justice: in brief, he should possess every virtue which ennobles man;—should cause the laws, by which the society is governed, to be impartially executed, with justice and judgment: should cause to be punished with severity all ill, immoral, and scandalous members of the society, of what state or condition soever: should have the legal sentence of law executed with the strictest justice and impartiality: yet, where it can be exerted with safety to the general weal, and where it is not scandalous to the morals of the people, he should incline to mercy; for that should be his distinguishing characteristic.

In searching the history of this country, the best, wisest, and most virtuous of her princes were those who appear to have been educated, in the early part of their lives, in the school of adversity, without much prospect of enjoying the regal dignity, or who lived in factious and troublesome times. Such were *Alfred*, *Henry* the Second, *Elizabeth*, *James* her successor, and some few others, who appear to have got to the throne after the endurance of much trouble.

Attributes of Sovereignty—Consist of a crown, sceptre, and imperial throne: the first, קֹהֶן, *kohen*, was the name first given by the astonished Israelites to those brilliant and transcendent rays which proceeded from the face of the legislator *Moses*, on his descent from Mount Sinai, after his conversation with the Lord, JEHOVAH, so intensely bright, that they dared not view his super-human appearance; in fact, could not, without experiencing a sacred dread and religious terror: see *Exod.* xxxiv. 29. Therefore, they had previously prayed Moses, “ Speak thou with us, and we will hear; but let not God speak with us, lest we die.” *Exod.* xx. 19. From the record of the above circumstance the word is presumed to have its root; but it is subsequently used in *1 Esdras*, ii. 62, with a different termination, though evidently derived from the preceding radical, קְנָנָה, *kennah*, rendered *Kinnan sacerdotalis presbyterium cœtus judicium*:¹⁶ derived immediately from קֹהֶן, *kohen*, or *cohen*. *Cohen sacerdos politice administer*.¹⁶ The SCEPTRE was also a very ancient scriptural word, denoting supremacy or authority,

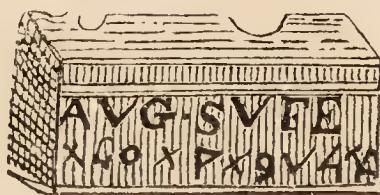
¹⁶ *L'Abbe Pluche's Hist. du Ciel*; et *Buxtorff's Lexicon Hebraicae*.

among Jews and Gentiles; it is presumed to have likewise derived its origin from *primæval* customs, *the crook of a shepherd*. We often see the government of the heads of tribes distinguished by this appellative mark; as “The sceptre shall not depart from Judah, nor a lawgiver from between his feet, until Shiloh come:” *Genesis*, xlix. 10. “Thy rod and staff doth comfort me,” says *David*. The augural staff in Egyptian hieroglyphics, also, nearly resembles it.

A THRONE has, in all ages, countries, and nations, intimated the seat of supreme authority; whence the senators of ancient Rome used what they called *curule chairs*.

The *Achians*, or Athenians, were, we believe, the earliest people on record who were governed by a popular assembly; the chief of their oligarchy or democracy was denominated *Ἄρχων*, *Archon*: they first had kings for several ages.

The *Pæni-Carthagenians* were the next we read of, as a considerable people, who were so governed: their chief magistrate was called שופט, *sufete*. Subsequent to the subjugation of Carthage by Rome, their emperor assumed that title, as appears from an inscription recently received from the Bey of Tripoli, as a present to the sovereign of Great Britain, among other antiquities, said to have constituted a portion of the ruins of ancient Carthage. The vestige alluded to is the following:



Improvements.—There are, in many arts and sciences, numerous additions, whose *improvements* will admit of a question. But all national adulation apart, as a member of the British population, setting aside every compliment to a parent country, and entirely relinquishing every natural feeling of personal and particular consideration, as a dispassionate British friend of humanity,—we proudly boast of the wisdom of British legislation, in the formation of its constitutional government. And in this we are justified; inasmuch as it is a tribute, which on all hands, and even by the enemies of our country, is deservedly allowed her and generally admitted. No country under heaven can boast of so eminent a specimen of legislative wisdom, as distinguishes the fundamental principles of the British constitution: nor is there any form of government, we recollect the memoir of, which has existed for so long a

period as near 2000 years, which has not been deteriorated or finally destroyed. The British government, it is true, has suffered many struggles, and endured some few falls; but then, rising, like gigantic *Antæus*, overpowered by the son of Jove, who felt his strength renewed, and himself renovated with vigour, every time his mother, the earth, received him on her ample bosom: so the British constitution has obtained fresh strength and additional firmness, with its beauty improved from exertion, and risen with increased lustre from every conflict.

A vital principle in all governments consists in order: this is observable in the British constitution in an eminent degree. So there is also, in every well-governed community, a reciprocal interest existing between the governor and governed. In the former, it implies equity, moderation, and mercy: and in the latter, a willing obedience to just, equitable, and wholesome laws; attachment to the chief powers; and a voluntary devotion to the good of the commonweal. Thus, the chief magistrate and people support and assist each other; they respect each other, and venerate their own character; which is the only certain mode to ensure the respect of the world. In all associations of individuals, *government of some sort is essentially necessary*. Now, what government can be so desirable as that in which every individual of the vast mass has a voice, or elective franchise secured to him by birthright? It assists him in controuling the actions of those who might have the power to injure him in his dearest interests; in reproving or approving the conduct of public functionaries; and, lastly, in participating in the legislation of his country. This was what the Roman authors we have previously named so much approved, but which they thought impracticable: yet does this appear in the British government. In all governments, their support and maintenance are essentially necessary. This, in many states, has been done in different ways: and even in the same states has it varied at different periods; witness the free states of Greece, the republican, and even the imperial one of Rome. All which governments were, at first, supported by the enterprising military spirit of the hardy inhabitants, and the aspiring views of their rulers. However, when they had by these means acquired empire, then from a martial they became a pacific, and the former, a truly ingenuous people, as eminent in the arts which humanize the mind of man, as they had been formidable in those of unyielding war; sustaining their country, and supplying its government, by ingenuity of inven-

tive genius, and exquisite workmanship; also, by commercial exchanges with foreign nations, with that support its necessities required. Then we perceive their government was supplied, like our own, by various imposts on articles of trade, constituting the luxuries and often the necessities of the people,—on imports and exports.

The people, therefore, supplying so large a portion to the public support, were equitably allowed a voice in its distribution. In this country, the wisdom of our Saxon ancestors saw the justice of permitting a large participation of power to remain in the hands of the people. However, it seems probable, that, at the first, this privilege extended only to matters of finance, and affairs connected therewith: but progressively their prerogatives have been permitted to extend to most concerns of legislation; and generally some of their delegates occupy, by special appointment, a seat with the hereditary councillors of the throne at the council-board. On the whole, the people of the British empire hold a much larger portion in the direction of its government than is known to be enjoyed by the subjects of any other monarchy under heaven. The equitable balance of the British constitution renders it deservedly the admiration of all sober, statistical, and philosophic minds: because the triple power of which it is composed is so delicately kept in *equilibrio*, so justly poised, and its balance so delicately, so admirably maintained, that rude indeed must be the shock, daring the attempt, and diabolical the motive of any who would lend a hand towards the destruction of the awful, the glorious fabric!—more dire than hell must be the heart who would participate in its parricidal destruction!

The component parts of the British constitution are as follow:—I. The KING, whose chief *duties* are to govern the people according to the laws of the land, common or prescriptive, which law precedes the written or statute-law; and likewise according to the *leges scriptæ*, or statute-law; and which likewise includes the administration of these laws with justice and mercy. To be the public and effective organ of the people, in all public operations, domestic and foreign; to make war and peace; cautiously circumspect to survey the moral habits of his people; to check excesses of every description; with jealous care to watch his own prerogative, not to suffer its violation or infringement; nor to suffer any one order of the people to violate or infringe upon the prerogatives of another. In this point of view, he is the great conservator of the public peace, as well also as the power whose authority is presumed to be omnipresent in his

dominions, and to protect them from violation by any ; therefore, in all criminal accusations, the formula ends by declaring, that it was an offence committed “ *against the PEACE of our Lord the King, his crown and dignity.*” Here, also, he is considered as the protector of the lives, liberties, and properties of his subjects, and the guardian of their happiness. All which effects he has the power to produce, by his superior authority in his council and in parliament.

II. The LORDS, or Upper House, as it is called, are the constitutional or hereditary councillors of the crown ; these consist of princes of the blood, chief officers of state, arch-bishops, dukes, marquises, earls, bishops, viscounts, and barons of the land. They are the same as the *Wytte*na *Leomote* of the Anglo-Saxons, or an *assembly of the wise and prudent*. This House, besides its legislative functions, is a court of record, and the last resort of appeal from all inferior courts. They also look after the crown and the people ; protest against improper actions in the one, if of a public nature, and annul the other by their authority. Their persons are sacred from arrests in civil suits, and they are proceeded against by bill, noticing parliamentary privilege. They are, properly and comprehensively speaking, the arbitrators between the crown and its subjects ; consequently, under the crown, it is the supreme power in the empire.

III. The COMMONS, supplying so large a portion of public wealth, are, by a fundamental principle of the constitution, the legal imposers of all taxes ; they may therefore be said to tax themselves. They have also a consequent prerogative to direct the distribution of public money, to impeach regal ministers for its misapplication, or for other flagrant mismanagement in their official capacities : also to unite with the other branches of the constitution in the distribution of public money, and other important concerns, which may be thought advisable for general security and advantage. Almost all public acts originate in the Commons’ House, wherein they are read *three* times ; if approved by a majority, they undergo a like investigation in the Upper House ; if approved of there, the King usually goes personally to that house, or else meets them by commission ; in such case, his assent is usually given from a throne of state, where the Commons, also, by deputation, meet the King. Then what was before a *bill* becomes an *act*, and is registered accordingly, when it is observed by the King as well as his people.

SECOND PART—THE FIRST EPOCH.

ON LANGUAGE.

Definition.—**LANGUAGE**, in its most general sense, implies that operation of the oral faculties, in man or other animals, which is essential to make their wants known; to caution their species against danger; to express satisfaction, or to communicate the feelings of the creature to its fellows. In man, these are articulately expressed; but in other animals, the impressions of nature are proclaimed in general terms,—or in *gross*. This is the necessary and general distinction. In man, it implies the expression of ideas by *articulate* sounds: by articulation is meant those modulations of simple voice, or sounds emitted from the thorax, and formed by the mouth and its several organs, *i. e.* the teeth, tongue, lips, and palate; however, in certain languages, the aid of the nose is also required; sounds so produced are called *nasal*: sometimes an extra exertion of the power of the throat is required, which gives *guttural* sounds.

ARISTOTLE'S Definition.—Speech is said, by that philosopher, to be given to man to indicate what is expedient and inexpedient; and, consequently, what is just and unjust may be likewise ascertained from its application: he, therefore infers its moment to the species, as well in *utility* as in a *moral* point of view.

Reason for its Origin.—Man was formed for a *social* creature, meant to benefit his fellows, and also reciprocally to receive benefit from them. However, previous to association, some *cause* for it must be discovered; this will be readily seen to proceed from *individual human weakness*; because, we know that for any individual to exist totally independent, if not impracticable, after having been accustomed to social habits, is highly inconvenient. Nevertheless, in families and small societies, our desires might be made known, our wishes signified, our volitions intimated, and our commands obeyed, from other modes than speech; by gesticulation, looks, frowns, or smiles, or any other local signification. But this would be inadequate, where many families had associated, for any expedient to be made known by this means to the species. For it should be constantly re-

membered, that, in the words of the Greek historian,¹ “*necessity was man's first instructor.*” Here we must infer the existence of a *necessity* for a considerable association of the species, to accomplish some common work which they had conceived would be generally beneficial to the whole. And here the expediency of enlarging the mode of communication will be obvious. Distinct terms and definite articulation was the medium to which they resorted for such satisfaction.

Whether of Human Invention or Divine Origin—is a question which has employed the ingenuity of many eminent men; who have bestowed upon it those nicely acute perceptions for which their several minds are justly celebrated. Among those who embrace the former position, appear the respectable names of MOCHUS, the *Phœnician*; DEMOCRITUS, the *Abderite*; EPICURUS, the *Athenian*; DIODORUS, the *Sicilian*; LUCRETIUS, HORACE, and other eminent Greeks and Romans: and among the moderns, *Father Simeon*, *Voltaire*, *Condillac*, *Doctor Smith*, and the respectable *author of the Origin and Progress of Human Language*: whilst those who contend for its being of divine descent, among modern authors, are the very celebrated names of men, whose literary characters are as eminent for ability, as they are famous for the application of superior talent as illustrative advocates for the Christian profession; i. e. *Warburton*, *Delaney*, *Johnson*, *Beattie*, *Blair*, *Dr. Stanhope*, *Smith* of New Jersey, with innumerable others. We much regret that our very circumscribed limits will not permit a statement of their various opinions; however, the chief of them shall be mentioned. And, in order to render ourselves intelligible, it may be necessary first to state the following circumstances, as, upon positions which appear from these, most of them have taken hypotheses.

Distinction between the Voice of Man and that of Brutes.—The voice of brute animals appears intended by nature to express *no distinct* volition, or mode of thought; but their feelings are expressed in gross:—their voices are evidently analogous to our weeping, laughing, sighing, groaning, screaming, &c. indicative of passion or appetite.

Human Articulation.—By articulation, the voice of man is capable of uttering distinct sounds, which admit of resolution as well into first principles, as to define his intentions in every various degree; by which he expresseth not only his perceptions, volitions, and affections, &c. but intimates their

various degrees and reciprocal operation: whence both **HESIOD** and **HOMER** characterise him as *μεροψ*, or voice-dividing, intimating a power peculiar to the species alone. It is observed, that some few birds utter one or more of such sounds which may, perhaps, be resolved: yet, upon agitation, such resort to screams, &c.; so that it appears the former were employed as notes of natural music, rather than as notes of intimation to its kind. Another and chief distinction exists in this;—the language of man is learnt by insensible imitation; and where it is indigenous, almost *imperceptibly*; and a foreign language by books or oral instruction: but it is not so with animals; their language is solely intuitive, whence it becomes intelligible to all other animals of the same species, though brought together from the most remote parts of the earth.

An experiment is said to have been made by an *Egyptian* monarch, named *Psammaticus*, to prove whether the Scythian or the Egyptian people were the aboriginal inhabitants; but the result being unsatisfactory, the question yet remains undetermined. However, on the whole, it appears to be the most prevalent opinion on this head, that the question remains between the Chaldeans and Phoenicians, whose respective claims appear nearly equally strong. In this state of the question, we should have been inclined to go with the Phoenician, but that the awful evidence of sacred history presents itself, which is with us conclusive. A chief argument may be adduced, among many others, to prove the unassuming verity of sacred history, which may be thus stated, *with respect to the invention of language*:—admitting the necessity had existed among children to have invented speech; yet they could not have been *conscious* of it then; or, if they had, admitting both postulates, it does not follow, that they could have had ability sufficient to invent a science so profound as is language, with such accurate grammatical significations and logical distinctions, so subtle, so profound, and so perfect, as the most ancient known language is discovered to be. It would have been morally, physically, and logically impossible for the concentrated abilities of ten millions of children to have invented a thing so replete with intellectual intelligence. If it be impossible for children to have invented it, which we contend must have been the case, it would have been equally impracticable for man, in the maturity of his reason, and the perfection of his organs, to have invented or perfected it; and for this most palpable reason,—because he could not have formed his organs for articulation. This difficulty is discovered in the adult, when

he is learning to pronounce sounds in a language which is foreign to his native tongue: particularly is this the case with the Hebrew and the German, the Erse, Celtic, and modern Scotch, to an Englishman.

However, should it be contended, that the first man received *only* the mere elements of language from heaven;—if this be admitted, it answers our purpose, as he was left in that, as he appears to have been in most cases, to improve these first principles, as *necessity* might give him occasion, from actual observation and experience. It really does not follow, (we think,) although it should be proved, which by-the-bye is not yet done, that it was absolutely essential he should have had it perfect, although the Hebrew be as perfect as not to admit of any further improvement.² For man

² Of every known language there is none like the Hebrew for expressive copiousness, as from a simple root of *three* characters, every possible variation of a verb arises; as will appear by the following example in the—

Paradigm of a perfect Verb.

FIRST CONJUGATION, KAL.

INDICATIVE MOOD.

Singular.

Persons.	Masculine.	Feminine.
3.	לִמְדָה <i>lamed</i> , he did learn.	לִמְדָה <i>lamadah</i> , she did learn.
2.	לִמְדָתָה <i>lamadta</i> , thou didst learn.	לִמְדָתָה <i>lamadet</i> .
1.	לִמְדָתִי <i>lamadti</i> , I did learn, masculine and feminine.	

Plural.

3.	לִמְדָו <i>lamdu</i> , they did learn.	
2.	לִמְדָתָם <i>lemadtem</i> , ye did learn.	לִמְדָתָן <i>lemadten</i> .
1.	לִמְדָנוּ <i>lamadnu</i> , we did learn.	

PARTICIPLE PRESENT, or BENONI.

Singular.

3.	לֹמֵד <i>lomed</i> , he is learning.	לֹמְדָה <i>lomdah</i> , or לֹמְדָת <i>lomidith</i> , she is learning.
Plural.		

3.	לֹמְדִים <i>lomdim</i> , they are learning.	לֹמְדּוֹת <i>lomdoth</i> .
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PARTICIPLE, PAUL, or PUAL.

Singular.

3.	לִמְודָה <i>lamud</i> , he is learned.	לִמְודָה <i>lemudah</i> , she is learned.
Plural.		

3.	לִמְודִים <i>lamudim</i> , they are learned.	לִמְודּוֹת <i>lemudoth</i> .
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Note.—The other persons in the two last participles are formed by

being by nature an ingenious and docile creature, inclining his disposition to answer the expedience of necessity, and, as it should also seem, to call forth all his latent powers into action, to excite all the energies of his nature; from his accustomed habits, numerous wants would arise, if not essential to his being, yet imperious from indulgence: these would require new names, fresh associations, and attributives with various connections would obtain denomination. He is also daily exposed to new situations; and yet unknown circumstances constantly surround him; is compelled to resort to fresh expedients, to extricate himself from novel difficulties, in his frequent and complicated commerce with

prefixing their respective pronouns; as, **אני לומד** *ani lomid*, I am learning; **אתה לומד** *allah lomed*, thou art learning, &c.

INFINITIVE MOOD, OR GERUND.

לִמּוֹד *lamod*, learning; and with the letters **ב**, **בְּכָלָם** *beth caph*, **ל** *lamed*, **מ** *mem*, prefixed, as,

בְּלִמּוֹד *bilmod*, in learning. **בְּלִמּוֹד** *kilmod*, as learning.

לִלְמֹד *lilmod*, to learn. **מִלְמֹד** *millemod*, from learning

IMPERATIVE MOOD.

Singular.

Persons.

Masculine.

Feminine.

2. **לִמּוֹד** *lemod*, learn thou, learn ye. **לִמְדִי** *limdi*, learn you.

Plural.

2. **לִמְדוֹ** *limdu*, learn ye. **לִמְדֹנָה** *lemodnah*.

FUTURE TENSE.

Singular.

1. **אַלְמֹד** *elmod*, I shall or will learn.

2. **תַּלְמֹד** *tilmod*, thou shalt learn. **תַּלְמִידִי** *tilmedi*.

3. **יַלְמֹד** *yilmod*, he shall learn. **תַּלְמֹודִת** *tilmod*, she shall learn.

Plural.

1. **נַלְמֹד** *nilmod*, we shall or will learn.

2. **תַּלְמֹדוֹ** *tilmedu*, ye shall learn. **תַּלְמֹדְנָה** *tilmodnah*, ye or they

3. **יַלְמֹדוֹ** *yilmedu*, they shall learn. **תַּלְמֹודָה** *tilmodah*, shall learn.

Independent of the above first conjugation, there are the second conjugation passive, *niphal*; the third conjugation active, *piel*; the fourth conjugation passive, *pual*; the fifth conjugation active, *hiphil*; the sixth conjugation passive, *hophal*; and the seventh conjugation, *hithpael*, through every mood, tense, participle, infinitive and imperative, and in all the three persons, which would occupy at least two hundred and twenty lines, which room we cannot at present dispense with.

a numerous society. These he has occasion to communicate to his fellows to portray a diversity of feelings, for which he has yet had no name. For these he is indebted to his native ingenuity.

How new Languages have been formed.—The various languages and dialects which are found in the world may be accounted for by the following observations. The original language used by man appears to be that which was spoken by the *post-diluvians*, the remnant of which was evidently preserved by those who re-peopled the earth after the deluge; the same language which was spoken subsequent thereto in *Mesopotamia*, recognised by the name of *Chaldaic*, or *Samaritan*; this is that language which was spoken by all the human race before the “*confusion of the lip*,” as rendered by the learned Mr. BRYANT. After that event, when the species could not understand each other, but were dispersed into various people, nations, kindreds, and tongues, they emigrated into new settlements: where, being surrounded on all sides with new circumstances, fresh climates, novel events, and entirely unaccustomed associations altogether, it follows, that fresh names must be invented to render such known to his fellows who might be associated with him; thus new names would be *invented* and used; and the old, for which he had then no use, would be, in process of time, forgotten. In due time, the progressive increase of population would render fresh emigrations necessary; when the new colonies would have to undergo as equally novel a series of incidents, as those to which their progenitors had been exposed as above described: and so on, *ad infinitum*, like the undulations or vibrations produced in a calm sheet of water from the falling of a stone.

Certain Languages have been lost.—It is observed, that there have existed languages, of which there now remains no knowledge: an instance of this may be seen in what is known only by name, as the *Persepolitan*, or a dialect of the ancient Persian. In the district of *Merdasht*, and at the walls of the palace of *Chelminar*,³ or *Tackli Jemshid*, “the *Throne of Jemshid*,” are profusely sculptured characters which bear no resemblance to the Greek, Hebrew, or Arabic, or indeed to any other *known* character, except to the ancient Chaldaic, or Babylonian, (which appears equally unintelligible.) Likewise the *Phelvi*, or that language spoken in the mountainous parts of Persia. Had we room, this loss of tongues should

³ The city of forty pillars, originally destroyed by Alexander the Great, at the request of the courtesan *Thais*.

be further investigated. The chief reason may, however, find admission in the curse of Heaven visiting human guilt in the destructive guise of war:—clad in fury, and enrobed in flame, conquerors are resentful, capricious, generally tyrannical and cruel; they have wantonly extirpated the humanity of a country by sword and banishment: by destruction of which pestilence and famine are concomitants,—destroying those “*the sword would spare.*” Such has been the destiny of many oriental nations.—

Carthago fuit!

An elegant and learned writer,⁴ after taking a comparative and minutely discriminative view of all modern and most ancient languages, with that of our own, thus recapitulates his previously given opinions, and concludes with a rare eulogy upon the English language, in the following terms:—
 “But as we cannot here further pursue this subject, we
 “shall only observe, that these great and distinguishing ex-
 “cellencies far more than counterbalanced the inconveni-
 “ences that we have already mentioned; and although, in
 “mere pleasantness of sounds, or harmonious flow of sylla-
 “bles, our language may be inferior to the Greek, the
 “Latin, the Italian, and Spanish; yet in point of manly
 “dignity, graceful variety, intuitive richness, nervous energy
 “of expression, unconstrained freedom, and harmony of
 “poetic numbers, it will yield the palm to none. Our im-
 “mortal MILTON, slowing rising in graceful majesty, stands
 “up, as equal, if not superior, to any poet in any other lan-
 “guage that ever existed; while THOMSON, with more
 “humble aim, in melody more smooth and flowing, softens
 “the soul to harmony and peace: the plaintive moan of
 “HAMMOND calls forth the tender tear and sympathetic
 “sigh; while GRAY’S more soothing melancholy, fixes the
 “sober mind to pensive contemplation:—more tender still
 “than these, the amiable SHENSTONE comes, and from his
 “Doric reed, still free from courtly affectation, flows a strain
 “so pure, so simple, of such tender harmony, as even Arca-
 “dian shepherds would be proud to own.” *In varied num-
 “bers, and all the magnificence of Eastern imagery, the intrepid
 COLLINS rushes on our sight, filled with divine poetic fervour!*
 —Behold AKENSIDE advances his vast inventive genius,
 classic pen, and poetic fire, partaker of the eminence of all;
 daringly sublime, he boldly contends for the laureate wreath;
 —nor are his pretensions vain.—Nor must Ossian be over-
 looked, who, in most poetic excellency, has no compeer.

⁴ In the *Encyclopædia Britannica*.

“ But, before the rest, the daring SHAKSPEARE steps forth conspicuous,—clothed in native dignity, and boldly pressing forward with unremitting ardour, wildly lays claim to both dramatic crowns, held out to him by Thalia and Melpomene: his rivals, far behind, look up and envy him for these unfading glories; and the astonished nations round, with *distant* awe, behold and tremble at his daring flight. Thus the language, equally obedient to all, bends with ease under their hands to whatever form they would have it assume: and, like the yielding wax, readily receives, and faithfully transmits to posterity *all the received impressions.*”

Structure of the English Tongue.—That English which was spoken subsequent to the period of the accession of Norman tyranny in this country, and which yet remains as the basis of our language, consisted of a mixture of *Saxon*, or *Teutonic*, some few *Danish* words, some *British*, but chiefly *Norman French*. This hath been, however, gradually enlarged, enriched, and daily improving, in proportion as arts, sciences, commerce, and our intercourse with the world, has increased our knowledge and extended our intelligence. By those means our vocabulary has been daily improved; so that the language now in use among us includes a large mixture of scientific and commercial terms, an extensive choice of verbal expression, from stores yielded by *Jewry*, *Arabia*, *Syria*, *Mesopotamia*, various parts of *Africa*, *Greece*, *Rome*, *Hindostan*, *Tartary*, *Russia*, *Sweden*, *Prussia*, *Poland*, and even *China*, and also, in brief, by most ancient languages, as well as modern European tongues.

By those means it assuredly has become the most copious of languages in the world, ancient or modern, as will appear from its easy reception of every topic which can be possibly discussed, from the dry matter of fact in science and history, up through every gradation into the regions of poetic fervour, and the wrapt contemplations of the muse, in the elegiac, lyric, and epic effusions of the genius of poesy. Nothing can exceed its flexibility and native ease, except it be its nervous elegance and graceful dignity. However, from the influx of so many currents,—from so great a variety of dissimilar parts,—it would be, indeed, miraculous to find a complete coherence in all its members: partaking of the excellencies of numerous tongues which are embodied in its form, it must naturally, also, partially participate of their defects; and, also, like every other compound tongue, what it has gained in copious variety of expression, it *may* have lost in simplicity. As where a language is *videtur ex senatus*, its mode of construction will, in some sort, direct its

use. Consequently, much more skill will be found requisite in the *proper* use of the English tongue than is *generally* supposed to be essential, to prevent the heterogeneous and unnatural association of parts; to obviate the discord resulting from a disunion of opposite elements, unskilfully and confusedly mixed together; thence requiring more than ordinary skill to form a perfect whole, free from those impurities of association, and those expressions which readily present themselves to minds not properly exercised, and always on the alert to meet such constant delusions, and skilfully prepared to parry off temptation to verbal delinquency. In so much, that more than common knowledge of the general principles of its grammar will be found expedient: so much skill in *general or universal grammar* will be obviously necessary, as includes a knowledge of the grammars of the respective languages which contribute to its formation, to express ourselves with purity and perspicuity. Notwithstanding this unavoidable want of simplicity, the *syntax* of the English language is uncommonly confined; consisting, at most, of not above sixty or eighty rules; and these extremely simple, and strictly according with the nature of things. The previous difficulties arise from the want of that verbal agreement which exists in the *transpositive* languages. Yet there want not instances of exquisite productions in our language, by men who were not intimate, perhaps, with the grammar of any other tongue than of their own language only. But such examples are rare, and must not generally be depended upon. In all such cases, we must presume that those peculiarly distinguished authors were fully masters of the subjects which engaged their pens; and in such case, *Longinus* informs us, “Nature will herself find adequate clothing for our conceptions.”

Should there be disadvantages in a compounded language, these are balanced by various excellencies which attend it: to instance only the choice of expressions, which are allowed in great variety. So exceedingly copious is our tongue, that in every species of composition, no complaint can be supported of our want of words *properly* to express ourselves in prose, as well as in the most exalted of poetic compositions. Our poetic style differs so much from the prosaic, —and not in respect to *numbers* only,—but as far as the *quality* of words are concerned; which is a convincing proof of the extent and excellence of our stores, yielding clothing to every idea which can possibly exist in the most luxuriant imagination.

In this the superiority of our language is evident, excelling every modern European tongue. Although with respect

to certain inferior peculiarities, some of those languages may possess advantages which we do not enjoy.

Let us see,—of modern European languages the Spanish first presents itself, because it has a nearer affinity to its parent, the Latin, than any known language: this language certainly surpasses ours in imperial, pompous, and senatorial dignity, chiefly arising from the length and sonorous melody of its words. The Italian next presents itself; a compound likewise, formed from the ancient Roman and the northern tongues,—the language of those barbarians who ravaged Rome upon the final demolition of her imperial splendour.

The inhabitants of ancient *Latium*, like those of modern Italy, possessing exquisite ears for music, were disgusted with the barbarous jargon of their conquerors, who themselves found it expedient to learn as much of the ancient language as served their necessities: those two distinct people, brought together by the accident of conquest, united to form a language now known as the Italian, which for feminine softness is not to be excelled, arising from the excess of its mellifluous vowels. The language of Italy has been also attended to, with uncommon care, and much improved of late years, by the Italian people, as their *Accademia della Crusca* will evince.

The French is much admired for the ease it affords in light conversation. A native of *Switzerland* informed us, that he, going to reside in Paris in his youth, could not at first discover the cause that “enabled him to talk all day “*without being tired!*” which was his expression.

Our language has been thought to be deficient in *harmony*; yet its diversified modulation in the productions of our poets, to instance only *Shakspeare*, *Popé*, *Milton*, *Aken-side*, *Collins*, *Shenstone*, and *Thomson*, may convince us that the charge is false and made without judgment.

The complaint which has been urged by certain prejudiced foreigners against the sibilant sound of our *s*, as producing continual alarm to them, is also without the support of truth: should it exist any where, it is not in our tongue; but they have to charge the weakness of their own nerves, and the vicious habit they had contracted of indulging in the trifling levity and feminine softness of their own language. The sound of that consonant, when modified by the union of its neighbours the *r* or *t*, produces tones far from disagreeable. Indeed, when that obnoxious letter receives a grave sound, which it often does from association with other letters having a correct pronunciation, it produces very often, and particularly when preceded by the *t*, the soft

sound of *z*, which is a tone whereon the ear delights to repose. Those who complain of the want of harmony in our tongue, are invited to read the ductile language of that favourite of the harmonious muse, Mr. Pope, in his various works.

Although we have gratuitously admitted that the English language is destitute of that feminine softness, that flippancy, and perhaps that ease, which we have seen distinguish some other modern tongues ; it must be yielded to us, that if it be deficient in these,—yet it certainly possesseth qualities infinitely more estimable,—in its nervous strength, athletic power, and vigorous boldness of expression ; whilst, at the same time, it communicates a manly grace, possessing a healthy *stamina*, and is, as we have seen, from the examples of our poets, somewhat similar to that stability, strength, and exquisite beauty which may be discovered in the form of that beautiful animal, a well-bred horse ; where the anatomy of the bones, will be discovered to be clothed with vigorous sinews, powerful muscles, elastic ligaments, and a fleshy surface ; whilst its economy is sustained, vigour communicated, and energy supported, from the rich pastures and bounteous hoards of a liberal master, affording it life, energy, strength, and vivacity :—so does the sterling worth of our verbal treasures liberally supply, with generous freedom, the nervous flexibility of our idiomatic tongue, and allow its varied powers those resources, which continually preserve it pure and untainted from lethargic *ennui* and lifeless despondency.

Also, from a singular concurrence of fortuitous circumstances, it likewise possesseth the singular property of being (at the time it is derived from so great a variety of sources) the most simple in its construction of all living languages : being free from the intricacy of *cases, declensions, moods, and tenses*, its words are subject to less variation from the original roots than are those of any other tongue, ancient or modern.

Its *substantives* have no other distinction of gender than what is made by nature, and but one variation of *case* ; its *adjectives* admit of no change, but the *three degrees of comparison* ; its *verbs* allow of at most but *five* changes of *termination* ; a few prepositions and auxiliaries supply every change of their significant meaning, whilst the words generally retain their settled form.

It may be proved, were this the place, that where a Latin verb will admit of, at most, but two variations, ours, answering thereto, may be very conveniently extended, and

without unnatural contortion, to no fewer than *eleven* in the *present tense*, *six* in the *past*, and *twenty-four* in the *future*, with the simple assistance of auxiliaries and emphasis only; and every tense of our verb, it is calculated, will produce *ninety-six* variations, while the most which can possibly be made of its corresponding verb in the Latin tongue yields only two! Let arithmeticians judge, by their never-erring rules, of the proportionate difference!

Strength, energy, and expressive significance, are its grand characteristics:—like the hardy inhabitants of its soil, who endure the storms of elementary war, so their language can support itself with dignified ease, amidst the contentious din of man, and bear, like them, the shock of a convulsed world!

NAVIGATION.

The sacred records inform us that the ark of *Noah* was the first ship, and produced by the *invention* of the great Architect of Nature himself; and “though some men have “so believed,” says the learned and ingenious *Sir Walter Raleigh*, “yet it is certain the world was planted before “the flood, which could not be performed without some “transporting vessels. It is true, and the success has “proved that there was not any so capacious nor so strong, “as to defend themselves against so violent and so continued “a pouring down of rain, as the ark of which *Noah* was the “builder, from the invention of God himself. Of what “fashion or fabric soever were the rest, with all men they “perished, according to the ordinance of God.” And it appears extremely probable, that those testimonials, whereof *Ovid* speaks of former existence (*et inventa, est in Montibus anchora summis*) were remains of ships wrecked at the general flood.

There can be no question but that the Tyrians were the first maritime power in the world, as well in point of time as importance;—but of what species of construction their vessels were, we are not informed. Their merchants trading to the eastern Indies, as they did for *Solomon*; to *Ophir*, whence they brought gold; and also to this country for tin, and their having made three distinct descents upon America,² will enable us to maintain this our opinion. After them, the Greeks, a people living chiefly on the shores of the Hellespont, and Ægean seas, with many islands in the Medi-terra-

¹ *Raleigh's History of the World.* See his Discourse on Shipping.

² *Plato's Atlantides*, and *Maurice on Babylon*.

nean, Adriatic, and Archipelagian seas, besides their possessions in Asia Minor, and their commerce with the European continent, obtained the next power by sea. We read, indeed, that **MINOS**, the famous *Cretan* sovereign and legislator, who lived two descents before the Trojan war, sent out shipping to free the Grecian seas of pirates; which shows, as *Sir Walter* ingeniously infers, that there had been trade and war upon the waters before his time also.

The next in point of time and importance on record was the highly renowned expedition of the Argonauts for the golden fleece to *Colchis*, a country of Asia, on the Euxine sea. Immediately after this, was the colonization of *Cyrene*, in Africa, by *Battus*, one of the companions of *Jason*, in his Colchian expedition. Shortly afterwards, the Grecian states united against Phrygian treachery and the abuse of Grecian hospitality; forming another most memorable epocha in the history of the world. We are informed, the Grecian Neptune, or as mythology styles him, a *god* of the *Saturnian* family, for the great service he did his father *Saturn*, or *Noah*, against the *Titans*, had the seas given to him. History informs us, that the first inventor of rowing vessels was a citizen of *Corinth*, of the name of *Amœnacles*; and, likewise, that the first naval war was between the *Samians* and *Corcyrians*. The history of *Ithicus*, translated into Latin by *St. Jerome*, affirms that *Griphon*, the Scythian, was the inventor of long boats; and *Strabo* also gives the honour of the invention of the anchor to another Scythian, the famous **ANACHARSIS**, whilst *Greece* herself, by her historians, ascribes its invention to *Eupolemus*. Also, it is said, that *Icarus* invented the sail, and others, various other pieces of the component parts of ships and boats.³ The specification of such other imperfect memoirs, many of fabulous appearance, may be of no great importance.

It appears certain, that among the four sons of *Javan* the son of *Japhet*, the grandsons, and other the posterity of *Noah*, who peopled “the isles of the Gentiles,”⁴ the *Grecian* islands, must long before the days of *Minos* have used those seas, from the insular nature of their habitations. And it certainly does not appear extravagant to us, to presume that this people were among the first who navigated the seas. Mankind in various parts of the world, being stimulated by the same necessities, urged by the same wants, and possessing the same means, might probably produce similar inventions to each other. Most, indeed, had occasion to navigate

³ *Sir Walter Raleigh's “Discourse on Shipping,” p. 2.*

⁴ *Genesis, ch. x. v. 5.*

lakes and cross rivers. They accordingly constructed such machines as would answer their purpose of passage or migration. So were rafts and canoes, formed of canes, osiers, twigs, &c. where they grew, which they fashioned like boats, and then covered with skins of various animals; others formed rafts of wood; whilst some others fashioned canoes, having hollowed out trees for that purpose. One way or other, each people thus possessed a marine, proper for their purpose it is true, but in various degrees of excellence. This was the case with Greeks as well as barbarians of all nations; all these people, excepting the immediate descendants of Noah, might, perhaps, lay a feasible claim to the honour of the original invention of these articles; and, having never seen such, they virtually have each a good title to the distinction. Indeed, many of them might have taken the idea for such invention from the policy of certain animals, and the nature of others; to instance only the sagacity of the *beaver* and his raft, and the little *nautilus* with his swelling sail: hence they might have *adopted* from that animal, and that piscatory insect, the idea of a raft, and also of a vessel with a sail.

In latter days, we find the Teutonic Saxons first came to this country, according to Mr. *Turner*, the Anglo-Saxon historian, in vessels they called *cyules*—*kells* by Sir Walter Raleigh. Marine vessels have borne a variety of names, as well as of numerous figures, from the *gondola* of the Venetians to the canoe of the Esquimaux,—the British man-of-war to the ponderous *bonaventure* in which the *Doge* annually espouses the sea.

All those nations, too, through whose hands the maritime power has passed, from time to time, as they have been instructed by experience or taught by necessity, might repeatedly have made additions and improvements in naval architecture: some calculated for mercantile utility, whilst others have only attended to warlike strength, and some to answer both purposes, like our Indiamen. But now, the British navy, being supplied with the best materials, and having as ingenious workmen as any, with the addition of its warlike children, may defy all other nations, and proudly claim the sovereignty of the watery world; they having proved repeatedly that their claim is not without foundation.

COINAGE.

Although coinage and money are said to be two distinct things; yet, from habitual use, it is difficult to name the one and not think upon the other. The distinction lies here:

MONEY consists of any matter to which public authority has fixed a value, and which may serve in any situation as a circulating medium, whether it consists of paper, leather, shells, iron, &c.; but COIN is a particular *species*, of which money is the *genera*; and it is always made of metals more or less valuable, in the shape of medals, and struck according to a certain process. This definition is given, because it may be necessary to direct the reader, in circumstances to be presently advanced.

We read of *money* in a very early period of the sacred history of the Jews, even so early as the 23d chapter of *Genesis*, where *Abraham* is represented v. 8 — 16, conferring with the sons of *Heth*, about a burial-place for *Sarah*, his wife. “And he communed with them, saying, If it be your mind that I should bury my dead out of my sight, hear me, and entreat for me to *Ephron* the son of *Zohar*, that he may give me the cave of *Machpelah*, which he hath, which is in the end of his field: for as much MONEY as it is worth he shall give it me, for a possession of a burying-place among you. And Ephron dwelt among the children of *Heth*. And Ephron the Hittite answered Abraham in the audience of the children of *Heth*, even of all that went in at the gates of his city, saying, Nay, my lord, hear me: The field give I thee, and the cave that is therein, I give it thee; in the presence of the sons of my people give I it thee: bury thy dead. And Abraham bowed down himself before the people of the land. And he spake unto Ephron in the audience of the people of the land, saying, But if thou wilt give it, I pray thee hear me: I will give thee *money* for the field; take it of me, and I will bury my dead there. And Ephron answered Abraham, saying unto him, My lord, hearken unto me: the land is *worth* four hundred shekels of silver; what is that betwixt me and thee? bury therefore thy dead. And Abraham hearkened unto Ephron; and Abraham weighed to Ephron the silver, which he had named in the audience of the sons of *Heth*, four hundred shekels of silver, *current money* with the merchant.”

It should appear from hence, that the value of this purchase, although it is probable its currency was denoted by some impression, was weighed, in order that the seller might be satisfied he had weight as well as tale, in the same manner and, perhaps, for similar reasons, that gold was at one period weighed in this country. The next mention we find of *money* occurs in chap. xxxvii. ver. 28, upon the sale of the person of *Joseph* to the *Midianites*, in these words: “Then there passed by *Midianites*, (Arabian,) “merchantmen; and

they drew and lifted up Joseph out of the pit, and sold Joseph to the Ishmeelites for twenty pieces of silver ; and they brought Joseph into *Egypt*."

But in early times in *Greece*, as well as among other primæval people, **BARTER** was the chief mode of exchange ; we find it common in the heroic ages. Thus in *Iliad* 5, upon the interview between *Glaucus* and *Diomed* ; they exchanged arms, the value of which arms the poet expresses as follows :

" For Diomed's brass arms of mean device,
 " For which *nine oxen* paid, (a vulgar price,)
 " He gave his own, of gold divinely wrought,
 " *A hundred beeves* the shining purchase bought."

Pope's version, Iliad, b. vi. ver. 294, ut supra.

There can be no doubt, but the inconveniences of barter first inclined men to fix upon some general medium to answer relative value in all places. That, therefore, which was of the same value in one place as another, appeared to be the substance they agreed upon : they had also to adopt such which would be liable to less accidents to deteriorate their value ; such which were most portable, neat, clean, and convenient. Hence, to answer all these views, the more valuable *metals* of silver and gold appear admirably adapted : they were accordingly fixed upon : after their superior value by their known scarcity was ascertained. Inferior metals, as iron and brass, were also used for a fractional and relative medium, and where a smaller division of value was required.

Herodotus ascribes the invention of coins to the *Lydians*, which is extremely probable, because that people worked the first known mines of those precious metals. The inhabitants of *Lacedæmon* being directed by the Oracle to gild the face of *Apollo*, inquired where they could get so much gold ? the response answered, " of *Cræsus*, the king of *Lydia*." But *Pliny* attributes coinage to *Bacchus* ; now, admitting this *Bacchus* was the Egyptian *Osiris*, of which there can be little doubt, from the mines that prince possessed,¹ *Pliny*, also, may be correct in his conception. We read that *Lycurgus* ordered that iron money should be used at *Sparta* ; whence, it is said, we may infer that a better kind had been known there. The introduction of copper coin into *Italy* is ascribed to *Janus*, or *Saturn*, the oldest of her kings. We may learn, however, from *Pliny*, and other respectable authorities, that silver was not coined at *Rome* until the year 480 of that city, nor gold till 640 of the same æra.

¹ *Vide Diodorus Siculus, b. ii. chap. 4.*

It has been believed, that the *Hebrews* had no coins of their *own*, till the time of the *Maccabees*; their money before the period of their return from captivity, is said to have been shekels, talents, and drachms, which the *Chinese* still use.

From the present practice of mankind, and man is now very nearly the same identical creature he ever was, we may infer, that when those weights, by which the standard value of metals were known became altered, and the metals themselves alloyed below their proper value from human fraud, the necessity for weighing became obvious; whence we may suppose the same motives, in those early days, for ascertaining by weight their coinage existed, and hence also may be traced the origin of coins, legends, dates, effigies, &c.

However, it remained for *Rome*, according to *Pancton*, to teach the world the criminal art, as he calls it, of debasing the purity of metals intended for coins, particularly of gold. (Vide his *Metrologie*, p. 329.) This metal had not above $\frac{1}{50}$ part of alloy. *Pliny* says, in lib. xxxiii. ch. 3, that the *Romans* mixed an eighth part of alloy with their silver coin.

“ *Livius Drusus in tribunatis plebis octavum partem æris argento miscuit.*” In another place the same author thus adverts to their illegal debasement of money, “ *Miscuit denario triumvir Antonius ferrum; miscuit æri falsa monetæ.*” Lib. xxxiii. ch. 9.

The quantum of alloy is now and has always been of great importance with respect to the durability of coins. The most general alloy in gold is copper, and sometimes a certain proportionate weight of copper with silver.

In order to ascertain the best kind of alloy for gold coins, a chymical inquiry was instituted in London, in 1798, under the inspection of *Henry Cavendish*, Esq. F.R.S. and *Charles Hatchet*, Esq. F.R.S.; the result of their experiments was, that “ Gold coins are not so likely to wear by abrasion and friction, if alloyed with silver and copper, as if with copper only; but that the difference between them, provided the copper be very pure, is so little, that there is no sufficient reason for altering the present alloy, consisting of copper alone.” See *Phil. Trans.* for 1803.

In all governments, which are well regulated, there has been a standard alloy for coins, regulations for the quantity of pure metal, and the portion of alloy. In England the standard for gold is $\frac{11}{12}$, i. e. eleven parts of pure metal and one of alloy. The standard for silver is $\frac{37}{40}$, i. e. 11oz. 2dwts. of silver and 18dwts. of alloy, making one pound *Troy*. The proportion for silver alloy is reported to have been fixed in the reign of *Ric. II.* by certain persons from the east of *Germany*, called *Earteplingzr*, whence came the term *sterling*,

subsequently given to the silver penny, and now applied to all our lawful coin.

The following statement will evince the depreciation of our silver coin from William I. to Elizabeth, which is owing to a variety of causes, but chiefly to the discovery of mines of the precious metals in various parts of the world: because it is the same with these, as with other commodities, the more there is in the market, its value is proportionably reduced. This observation should be also made, that *troy weight*, or the pound of twelve ounces, was not used before Henry VIII.; before that period, gold and silver were weighed by what was called the *Tower* pound, which had been used by the Saxons, lighter than the pound troy by $\frac{3}{4}$ of an ounce.

The Tower pound, coined,	s.	d.
anno 1066 into 20	0	
1300 20	3	
1344 22	2	
1346 22	6	
1353 25	0	
1412 30	0	
1464 37	6	
1527 42	2 $\frac{1}{4}$	pound troy 45 0
1560 56	3	..... 60 0
1601 58	1 $\frac{1}{2}$	..... 62 0

The coinage of the first William was upon a very simple plan. The *Tower* pound and the pound in tale were divided into 20 shillings, and each shilling into 12 pence, or sterlings; and the pound weight was divided into 12 ounces, each ounce into 20 dwts. The weight of each penny, or sterling, was one pennyweight, or 24 grains. This plan of coinage was, as is said, adopted from Charlemagne, who regulated his coinage thereby in the eighth century.

In 1257, it is recorded, that the first *gold* coin in this kingdom was struck by order of Henry III. It was of pure gold, weighing two-pence, or sterlings of silver, and was to pass for twenty-pence. This *gold pennie*, as it was called, was near the weight of a seven-shilling piece. *Snelling* says, “the king tried this, through necessity, and also that the city of London made a representation against the measure.”¹ The next gold coinage was in 1344, when the gold *florin* was struck, which took its name from Florence, where it had been first coined, anno 1252. This coin was matriced in most of the European mints. In *Germany* they called it a *golden*, in *Holland*, a *guilder*. This coin had been long used as a silver coin, in many places: its value is still preserved,

¹ *Snelling on Gold Coins*, p. 2.

as a remit in keeping accounts, under an imaginary denomination.

In various ages of the world, the value of the precious metals used for coinage have fluctuated. *Herodotus* states, that in Persia, in the time of *Darius*, son of *Hystaspes*, it was as 13 to 1. Other historians affirm, that in the early ages of Greece it was as 12 to 1; and that in the time of Alexander the Great, it was as 11 to 1. This was the proportion in Rome until the time of Julius Cæsar, when, from the great influx of gold brought from conquered countries, it was to silver as $7\frac{1}{2}$ to 1. This proportion was, however, only temporary.

In England, from the time of the Saxons till the discovery of America, the relative value of gold and silver was about 11 to 1. In the reign of Elizabeth it was as 13 to 1. In China and Japan, in 1717, it was as 9 or 10 to 1, (according to Sir Isaac Newton's representation to the Lords of the Treasury at that time.) In Spain and Portugal it was lately as 16 to 1; and in most other European countries, as 15 to 1. So that the relative value of gold and silver, in all ages and countries, may be averaged as within the limits of 17 and 7 to 1, or 12 to 1.

On reviewing the history of coins, it appears that there has been, in general, progressive reduction in their value, and that few instances occur of any advancement. The depreciation of the value of money in England, from 1066 to Elizabeth, was produced partly by debasement of the coin, and partly by the increase of gold and silver mines in Europe. From this last period to the revolution, the chief cause of reduction was the discovery of the gold and silver mines in America. From the revolution to the present period, the depreciation was occasioned both by the increase of the precious metals, and the substitution of paper currency, as a medium of exchange.

The following tables of ancient coins will be, perhaps, of utility. And first of the Jewish coins, showing their value and relative proportion to each other, with the sterling amount.

				£	s.	d.
Gerah.....				0	0	$1\frac{5}{16}$
10	Bekah			0	1	$1\frac{1}{16}$
20		2	Shekel	0	2	$3\frac{3}{8}$
1200	120	50	Maneh, Mina Heb.	5	14	$0\frac{3}{4}$
60,000	6000	3000	60|Talent	342	3	9

		£	s.	d.
Solidus aureus, or sextula, worth	.....	0	12	0 $\frac{1}{2}$
Siclus aureus	.....	1	16	6
A talent of gold	.....	5475	0	0

Value and proportion of ancient Grecian coins.

			s.	d.	qrs.								
Lepton	.....	0	0	0 $\frac{3}{30}$								
7	Chalcus	0	0	1 $\frac{1}{48}$									
14	2	Dichalcus	0	0	1 $\frac{7}{4}$								
28	4	2	Hemiobolum	0	0	2 $\frac{7}{12}$							
56	8	4	2	Obolus	0	1	1 $\frac{1}{6}$						
112	16	8	4	2	Diobolum	0	2	2 $\frac{4}{12}$					
224	32	16	8	4	2	Tetrobolum	0	5	0 $\frac{2}{3}$				
336	48	24	12	6	3 $\frac{1}{2}$	Drachma	0	7	3				
662	96	48	24	12	6	3	2	Didrachmon	1	3	2		
1324	112	96	48	24	12	6	4	2	Tetradra stater	2	7	0	
1660	384	120	60	30	15	7 $\frac{1}{2}$	5	2 $\frac{1}{6}$	1 $\frac{1}{4}$	Pentar	3	2	3

Of the above, the drachma and didrachmon were of silver, the rest, for the most part of brass; the others, as tridachm, triobolus, &c. were often coined.

Note.—The drachma is here, and with the generality of authors, presumed equal to the *Roman* denarius; although there is room to believe, the drachma was somewhat more weighty.

	£	s.	d.
The Grecian gold coin was the stater aureus, weighing			
2 Attic drachms, or half of the stater argenteus;	0	16	1 $\frac{1}{2}$
and usually exchanging for 25 Attic drachms of			
silver;—in our money			
According to our proportion of gold to silver	1	0	9
There was likewise the stater Cyziocenus, exchanging			
for 28 Attic drachms, or stater Philippicus, and	0	13	1
stater Alexandrinus, of the same value			
Stater Daricus, according to <i>Josephus</i> , worth 50 Attic	1	11	3 $\frac{1}{2}$
drachms, or			
Stater Crœsius of the same value.			

Value and proportion of Roman coins.

				s.	d.	qrs.		
Teruncius				0	0	$0\frac{275}{1000}$		
2	Sembella			0	0	$1\frac{55}{100}$		
4	2	Libella As		0	0	$3\frac{1}{10}$		
10	5	2 $\frac{1}{2}$	Sestertius	0	1	$3\frac{3}{4}$		
20	10	5	2	Quinarius victoriatus	0	3	$3\frac{1}{2}$	
40	20	10	4	2	Denarius	0	7	3

Note.—Of these, the denarius, victoriatus, sestertius, and sometimes the As, were of silver, the rest of brass.

There were also, sometimes, coined of brass, the triens, sextans, uncia, sextula, and dupondius.

		£	s.	d.
The coins of the Romans in gold, were the aureus, weighing generally double the denarius; the value of which according to the first proportion of coinage, mentioned by <i>Pliny</i> , was.....		1	4	$3\frac{3}{4}$
And according to the proportion now obtained amongst us, worth		1	0	9
According to the proportion decuple, mentioned by <i>Livy</i> and <i>Julius Pollux</i>		0	12	11
If taken by the proportion mentioned by <i>Tacitus</i> , which afterwards obtained, and by which the aureus exchanged for 25 denarii, its value will be		0	16	$1\frac{1}{2}$

Note.—The preceding tables are formed upon the presumption that gold is worth 80s. and silver 5s. per ounce.—*Vide* Arbuthnot's Tables of ancient Coins, also M. Raper, Esq. on the same subject, intituled, “An Inquiry into the Value of ancient Greek and Roman Money.” *Phil. Transactions*, v. lxi. part ii. art. 48, p. 462.

SPINNING.

The necessity for human clothing must be so obvious, we should think, at nearly the first existence of our species, that two opinions upon that subject cannot, we conceive, exist. For, admitting the region, where the first of human beings were stationed, was more congenial to life, than these our northern countries, yet the difference in temperature, between the heat of noon-day and the chilly damps of night, must be obvious to every one who has resided in tropical climates. Therefore, from *necessity*, we contend, our first

parents could not have dispensed with the benefit of clothing. However, independent of the necessity of the thing, the Jewish history informs us that the first man, *Adam*, and his wife, in consequence of their unfortunate neglect, lamentable, and even positive violation, of the institutions of their Divine Legislator, knew of their own nakedness;—and, therefore, they were *ashamed* to answer to the sacred summons. This they confessed with a simplicity congenial to truth, and in the same moment frankly owned the cause; answering to the awful interrogatory of, “Who told thee that thou wast naked? Hast thou eaten of the tree whereof I commanded thee that thou shouldest not eat?”—“The woman, whom thou gavest to be with me, she gave me of the tree, and I did eat.” However, it is previously said,—“And the eyes of them both were opened, and they knew that they were naked; and they sewed *fig-leaves* together, and made themselves *aprons*.”

It should be observed, that the leaf of the *banyan*, or Indian fig, is probably here meant: if it is, the luxurious leaf of this tree is about three feet long, and proportionably wide; therefore we may rationally presume much art was not required: probably a thorn might supply the place of a needle, and a blade of grass would do for thread.

Afterwards, we are told in the same chapter,—“Unto Adam, also to his wife, did the LORD JEHOVAH make coats of skins, and clothed them.” The preceding is the earliest account we have of humanity; at the same time, it also furnishes the most ancient relation of the original of human clothing. From hieroglyphical inscriptions we possess, the most ancient inhabitants of Egypt wore sometimes clothing made of feathers fastened together, sometimes of shells also attached to each other; but the most general ancient clothing consisted of the skins of various animals. So is *Hercules* and many of the heroes clothed, in antique statuary. Although the sacred history is silent on this head, yet, we may, perhaps, by inference, arrive at some clue or thread to guide us through the labyrinth of uncertainty.

Accordingly, we find the first passage which will admit of constructive inference, where we infer that thread of some sort must, of necessity, have had existence. “And *Ada*,” one of *Lamech*’s wives, “bare *Jubal*: he was the father of such as dwell in TENTS, and of such as have cattle.” Gen. iv. 20. Now, we submit, the inference of not only spinning, but also of weaving, and even sewing, must of necessity be conceded, before we can presume the existence of tents. The cloth whereof they were made at that period,

it is probable was of the fleece of sheep ; because, of the early existence of woollen cloth among the Greeks, we have no doubt, from the following and numerous other passages in their poets ; and also from the practice of the *Tyrian* artizans, who were, we know, generally and confessedly eminent for their dyeing the imperial purple, and other scarce, valuable, and beautiful colours ; and no substance better receives or so well retains the most splendid of colours than does wool. But *Homer* speaks expressly in point, where, in his *Iliad* 7, he describes the truce which took place between the belligerent armies of Greeks and Trojans. After the defeat of *Paris* by *Menelaus*, and where the laughter-loving goddess, *Venus*, is said to have arrested her favourite from the fate he deserved to find ; after she had conveyed the recreant hero from the field to his apartment, she then, like a true friend to matrimonial infidelity, goes in search of the Spartan queen, for the purpose of bringing the lovers together. She discovered the beautiful adulteresss on the walls of the city, where she had been describing to *Priam*, and his ancient nobles, the Trojan councillors, the various persons of the heroes of Greece. Upon this occasion *Venus*, to use the language of the poet, assumes,

“ To her, beset with Trojan beauties, came,
 “ In borrow'd form, the laughter-loving dame ;
 “ She seem'd an ancient maid, well skill'd to cull
 “ *The snowy fleece, and wind the twisted wool.*”

Pope's version, book iii. l. 478, ut supra.

The labours of *Penelope*, *Helena* herself, and innumerable other passages in the works of the poet, all tend to confirm the same fact.

That *Linen* had also an early existence is proved at a very anterior period of the Jewish history. They had even *fine linen* previous to the construction of the utensils used in sacred worship : as, in *Exodus*, an ephod of linen is expressly mentioned ; likewise in the xxvth chapter, 4th verse of that division, *fine linen* is likewise expressly enumerated among those presents that the people were expected to offer freely to the **LORD JEHOVAH** : whence we are justified in inferring, they had most probably learned in Egypt to carry its structure to great perfection.

We have linen mentioned, likewise, in *Homer*, upon the breach of the truce between the Grecians and Trojans with their auxiliary forces. On *Menelaus* having been wounded by an arrow from the bow of *Pandarus*, where the poet sweetly sings, *lib. 8.*

“ But thee, *Atrides*, in that dangerous hour,
 “ The gods forget not, nor thy guardian power,
 “ Pallas assists, (and weaken’d in its force,)
 “ Diverts the weapon from its destin’d course ;
 “ So, from her babe, when slumber seals his eye,
 “ The watchful mother wafts th’ envenom’d fly.
 “ Just where his belt with golden buckles join’d,
 “ Where *linen* folds the double corslet lin’d.
 “ She turn’d the shaft, which, hissing from above,
 “ Pass’d the broad belt, and through the corslet drove ;
 “ The folds it pierc’d, the plaited *linen* tore,
 “ And raz’d the skin, and drew the purple gore.” POPE.

From what appears in the subsequent, as well as the former part of this article, we submit, that not only the general manufacture of cloth, both woollen and linen, hath been established, and if this is made out, the anterior existence of the other subsidiary arts of *spinning*, *weaving*, &c. are also substantiated. We should add, because it belongs to our peculiar province, that we have *hieroglyphical symbols* in the *British Museum*, of the practice of the artizans of *Memphis*, *Thebes*, &c. in Egypt, but of Memphis in particular, which denote the various operations of the manufacture of cloths ; and upon a monument 3579 years old.

With regard to **KNITTING**, we refer our readers to a subsequent article expressly upon stocking manufacture ; it will be found in the *Last Period*.

Numerous arts have been discovered by mere accident. As we are told, the very valuable operation of *feldt*-making, —which, we should think, from the term, was of German invention, but that we recollect innumerable of our ancient inhabitants were Germans, who, of course, did not leave their language, the *Teutonic* behind them,—was discovered by a *British* sovereign, whose feet being very chill in winter, he had wool put into his shoes ; the moisture there contracted, the natural heat of the body, with the action to which this wool was exposed, between the feet and the shoe or sandal, caused the fleecy substance to consolidate ; whence the origin of that very necessary article, the **HAT**.

LOVE—MARRIAGE.

The sacred and solemn ceremony of marriage was originally sanctioned by the immediate commands of Omnipotence itself,— as the Mosaic writings inform us :—“ So JEHOVAH created man in his own image ; in the image of GOD created he him, male and female created he them. And JEHOVAH sanctified them, and GOD said unto them, Be fruitful and multiply, and replenish the earth,” &c. *Gen. i. 27, 28.*

In a subsequent place we are also told: “And the LORD “ JEHOVAH caused a deep sleep to fall upon Adam, and “ he slept: and he took one of his ribs and closed up the “ flesh instead thereof. And the rib which the LORD “ JEHOVAH had taken from man, made he a woman, and “ brought her unto the man. And Adam said, This is now “ bone of my bone, and flesh of my flesh: she shall be called “ Woman, because she was taken out of man. Therefore “ shall a man leave his father and his mother, and cleave “ unto his WIFE; and they shall be one flesh.” *Gen. ii. 21—24.*

To preserve the holy seed entire, we observe, also, to prevent contamination by commixture with idolatrous people, certain persons were, for ages afterwards, directed by Heaven from what families to take their wives.

And that the marriage state of mortals has been ever viewed propitiously by the supreme power, we may be assured, from the honour done to a ceremony of this nature, by the Messiah vouchsafeing to be present at a marriage feast; at which he also condescended to perform the first visible effects of his divine mission, by working his first miracle at this solemnity.

Also, that the marriage state has been advantageously seen by the wisest legislators, in all ages, we are assured, from repeated instances, of which human records inform us. This the poet has told us, when he says,—

“ *Cadmus* with curious art did letters frame,
“ But *SOLON* glories in the marriage tie.”

It was customary in ancient Greece for lovers to inscribe trees with the initials of the name of the party they adored; the walls of their houses were also thus marked, as were the books they used: in brief, there was no delicate way of indicating their passion, but what was resorted unto:— whence the learned Archbishop Potter, in his *Archæologia Græca*,² relates, from *Lucian*,³ the circumstance of one who fell in love with *Venus Cnidia*, after other expressions of his passion, adds, that there was never a wall or tree, but what proclaimed *Αφροδίτη ναλος*, *Venus fair*. So, also, *Callimachus*’s lover has the same fancy, only that he appears to have improved on the thought, when he is desirous that his mistress’s name might be written on leaves, provided the scholiast upon *Aristophanes*⁴ be entitled to credit.

¹ Potter’s *Archæologia Græca*, v. i.

³ Amator.

² *Arch.* v. ii. 241.

⁴ Acham.

Αλλ' ἐντὸς δὴ φύλλοισι κεκομμένα τόσσα φέροτεν
Γράμματα, Κυδιππην ὡς ἐρέωσι καλήν.

“ May the kind trees on leaves such letters bear,
“ As shall proclaim my dear *Cydippe* fair.” POTTER.

Likewise, in allusion to this opinion it was that one in *Euripides* declared, he should never have a good opinion of the female sex, though the pines in Mount *Ida* were filled with their names.⁵

Aristophanes had likewise his eye upon this custom, when jesting upon an ancient Athenian, who was nightly in love with deciding causes, he says that he wrote upon every thing Κημὸς καλὸς, which expression signified his affection for the cover of the judiciary urn.⁶

— Αν τὸδη γε πει γεγραμμένον
Τὸν Πυριλάμπτες ἐν Θύρᾳ Δῆμον καλὸν,
Ιὰν παρέγραψε πλησίον Κημὸς καλός.

It was, moreover, customary for lovers to deck the door of the party beloved with flowers and garlands; for thinking the person, on whom their affections were placed, to be the very image of the deity of love, their house was regarded as its temple;⁷ a place accustomed to receive such honours. From a similar original they appear to have derived the usual custom of making libations before the doors of their mistresses, and sprinkling them with wine. Of which the scholiast upon *Aristophanes*⁸ makes mention, when he reports, that many Thessalian gentlemen, who were in love with the beautiful *Nais*, thus publicly confessed their passion.

When a person's garland was untied, it was taken as a sure sign that the party was in love.⁹ The wreathing garlands, or composition of a garland in a woman, was a certain indication of her passion.¹⁰

— Εάν τις πλέχῃ
Γύνη στεφανον, ἐρᾶν δοκεῖ.

“ The wreathing garlands in a woman is
“ The usual symptom of a love-sick mind.” POTTER.

To discover whether their love would be successful, the young Grecians had recourse to those arts and practices which their mode of religious information intimated to

⁵ Eustathius, *Iliad* ζ'. p. 490, edit. Basil.

⁷ Athenæus, lib. xv.

⁹ Athenæus, cit.

⁶ *Vespis.*

⁸ *Aristophanes Pluto*, act. i. sc. 1.

¹⁰ *Aristophanes Thesmophor.*

them would disclose those secrets concealed within the bosom of futurity, charms, incantations, and philtres, they usually resorted to, as we shall see by the following instances:—the first quotation comes from the third Idyll of *Theocritus*, v. 28, and is pregnant with this property:

Ἐγνὼν πρὸν ὅπα μεν μεμναμένω εἰ φιλέεις με,
Οὐδὲ τὸ τηλέφιλον πολεμάξαλο τὸ πλατάγημα,
Αλλ' αὕτως ἀπαλῷ ποτὶ παχεῖ ἐξεμαρανθη·
Εἴπε καὶ Αγροιώ τάλαθεα κοσμινόμανθις,
Απρὸν ποιολογεῦσα, παραβάτις, θνεκ' ἔγώ μὲ,
Τὸν ὅλος ἔγκειματι τὸ δὲ μεν λόγον θδένα ποιῆ.

“ All this I knew, when I designed to prove,
“ Whether I should be happy in my love,
“ I press'd the *long-live*, but in vain did press,
“ It gave no lucky sound of good success:
“ To *Agrio* too, I urged the same demand,
“ A *cunning* woman she, I cross'd her hand,
“ She turn'd the *sieve* and *sheers*, and told me true,
“ That I should love, but not be lov'd by you.”

CREECH.

Another custom was that which they called *Κότταῖος*, a ceremony frequent in their entertainments.

When their love was unsuccessful they pursued various arts, and which were common among the Greeks as well as Romans, to procure the affections of the object beloved. The *Thessalian* women were famous for their skill in these practices, and other magical ceremonies. The means whereby this was attempted were of various sorts: sometimes by potions, called *φίλτρα*, *philtres*, frequently mentioned by authors in both languages, *Juvenal* thus speaks:¹¹

*Hic magicos afferit cantus, hic Thessala vendit
Philtrea, quibus valeant mentem vexare mariti.*

“ This pedlar offers magic *charms*, the next
“ *Philtres*, by which the husband's mind's perplex'd.” POTTER.

The operation of these were violent, commonly dangerous, and usually deprived those who drank them of their reason, nay, sometimes of their lives. *Plutarch* and *Cornelius Nepos* both report that such was the fate of *Lucullus*, the Roman general, who first lost his reason, and afterwards his life, by one of them. The life of *Lucretius*, the poet, was terminated in the same way. But, it is presumed, those two instances occurred from the same motive which stimulated *Dejanira*, with respect to *Hercules*, to

reclaim lost affections. *Caius Caligula*, also, as *Suetonius* reports, was driven into a fit of madness by a *philtre* given him by his wife, *Cæsonia*; as related by the same poet.¹²

— *Tamen hoc tolerabile, si non
Et furere incipias, ut avunculus ille Neronis
Cui totam tremuli frontem Cæsonia pulli
Infudit.* —

“ Some nimbler juice would make him *foam* and *rave*,
“ Like that *Cæsonia* to her *Caius* gave,
“ Who plucking from the forehead of the foal,
“ His mother’s love, infus’d it in the bowl.”

DRYDEN.

Ovid, at the time he shows the futility of these arts, thus deprecates the practice of them, at the moment he laments the depravity of the people accustomed to their use:

*Nec data profuerint pallentia philtrea puellis,
Philtrea nocent animis, vimque furoris habent.*

“ All pois’rous drugs and necromantic arts
“ Ne’er move the scornful maids’ relentless hearts,
“ They but distract the senses, seize the brain,
“ And *Venus*’ rites and mysteries profane.”

J. A.

The ingredients of which these *philtres* were composed were various; divers of which were thought to be effectual. One of the most remarkable was the *hippomanes*, a piece of flesh taken from the forehead of fresh-foaled colts, of the shape and size of a fig, which the mares bite off as soon as foaled, and if prevented forsake their offspring; whence it was thought a prevalent medicament to excite or conciliate love, especially when reduced to powder, and swallowed with some drops of the lover’s blood. This opinion was so prevalent in antiquity, that it is mentioned by the most eminent writers on natural history, since even *Aristotle*, *Pliny*, *Solinus*, *Columella*, and many others have thought it not beneath their notice. The poets are full of its effects; whence *Dido*, in the *Æneid*, (for instance,) is found to have recourse to it¹³ to recal the affection of *Æneas*.

*Quæritur et nastantis equi de fronte revulsus,
Et matri præreptus amor.* —

“ She, from the forehead of a new-foal’d colt,
“ The excrescent lump doth seek.”

POTTER.

Pliny also describes the same word in another sense, when he says, *Virus distillans ab inguine equæ coitum maris appe-*

¹² *Satyr* vi.

¹³ *Æneid*, lib. iv. v. 515.

tentis et in furorem agens. The opinion of Aristotle is to the same effect; whilst others allege the *hippomanes* to be a plant growing in *Arcadia*, which was also equally powerful in producing the same effects. Thus attested by Theocritus :¹⁴

‘Ιππομανὲς φυτόν ἐτι παρ’ Ἀρκάσι· τῷ δ’ ἐπι πᾶσαι
Καὶ πῶλοι μαίνονται ἀν’ ὕδεα, καὶ θοῖαι ἵπποι·
‘Ως καὶ Δέλφιν’ ἴδοιμι καὶ ἐς τόδε δῶμα περῆσαι
Μανιομένω ἵκελον, λιπαρᾶς ἔκποσθε παλαίσχεις.

“ *Hippomanes*, a plant *Arcadia* bears;
“ *This* makes steeds mad, and stimulates the mares;
“ O'er hills, through streams they rage; O, could I see
“ Young *Delphis* thus run madding after me.”

FAWKES.

This sentiment evidently confirms our previous opinion. Secondly, the bird¹⁵ *Ιүγξ*, sometimes translated *Iynx*, at others *passerculus*, *torquilla*, *frutilla*; also *REGULUS* was considered as potent in love affairs, first disclosed by *Venus* to *Jason*, on his *Argonautic* expedition, to secure the affections of *Medea*, as we understand from *Pindar*.¹⁵

Μανάδ ὄρνιν Κυπρογένεια φέρειν
Πρῶτον ἀνθρώποισι λιτάς τ’ επαοι—
δὰς ἐκδιδάσκησεν σοφὸν Αἰσονίδαν·
Οφεια Μηδείας τοκέων ἀφέλοι—
τ’ αἰδῶ.

“ The goddess *Venus* first disclos'd the use
“ To *Jason*, first, the magic charm display'd;
“ Told how the *bird* would fire the maid,
“ And glowing love into her breast infuse;
“ Nor duty, nor paternal love should bind,
“ Too weak and feeble is that force;
“ When *Iynx* steers the lover's course,
“ A safe admission he is sure to find.”

H. H.

It is said the tongue of this bird was preferred by enchanters; sometimes they fastened the whole bird to a wheel of wax, which they turned over a fire till both were consumed, thus to inflame the party in whom they had a mind to create love.

Many other things they also used for those purposes, much too horrible to mention; those things were given to produce affection, and also to create antipathies. These practices apart, we are bound to admire the extreme delicacy of the

¹⁴ Idyll. 5', v. 43.

¹⁵ Pythion, Od. iv.

Grecian people in love concerns. But we have seen enough of those practices ; now we propose to speak of the more sacred ceremonies of conjugal union observed by the Grecian people.

Marriage.—The first inhabitants of Greece, we are informed by the learned historian previously cited, lived without laws or government ; no bounds were prescribed to their passions ; their love, like the rest of their desires, was unconfined, and promiscuous mixtures, because unrestrained by human authority, were publicly allowed. The first who restricted their liberty in those respects was *Cecrops*, who, having raised himself to be King over the people, afterwards called *Athenians*, among many useful institutions, introduced Marriage.¹⁶ Others refer the honour of this institution, together with the invention of Dancing, to *Erato*, one of the Muses ; but some understand by that story the marriage solemnity, the regular conduct whereof, they say, was first ordered by *Erato*. However that be, it was in some time received by all the *Grecians* ; for, no sooner did they begin to reform their savage and barbarous course of life, and associate themselves in towns and village societies, than they found it necessary to confine the unruly lusts of the people, by establishing lawful marriage, with other rules of good manners.

Marriages were peculiarly honourable in many of the *Grecian* commonwealths, being the more so, because encouraged by their laws : the abstaining from it in certain states was punished ; for the strength of states consisting in the number of their people, those who refused to contribute to their increase were thought very cold in their affections to their *country*. In this respect, the *Lacedæmonians* are remarkable for their severity against those who deferred marrying, as well as against those who wholly abstained from it.¹⁷ No man could live beyond the time intimated by the lawgivers, without incurring severe penalties ; as first, the magistrates commanded such, once every winter, to run round the public *forum* naked ; and, to increase their shame, they sung a certain song, the words whereof aggravated their crime, and exposed them to ridicule. Another of their punishments was to be excluded from the exercises, wherein, according to *Spartan* custom, young virgins contended naked.¹⁸ A third penalty was inflicted upon a certain solemnity, wherein the women dragged them round an altar, beating them with

¹⁶ *Vide Archæologia*, lib. i. cap. 2.

¹⁷ *Stobæus*, lxv. *De laude Nuptiarum.*

¹⁸ *Plutarchus Lycurgo.*

their fists.¹⁹ And, lastly, they were deprived of that respect and obedience which the younger sort were compelled to pay to their superiors and elders; and, therefore, as Plutarch saith, “No man found fault with what was said to *Dercylidas*, a great captain, and one who had commanded armies, “who coming into the place of assembly, a young man, instead of rising and making room, told him, *Sir, you must not expect that honour from me, which cannot be returned to me by a child of yours when I am old.*” To these may be added the Athenian law,²⁰ whereby “all who were commanders, orators, or entrusted with any public affair, were to be married, and have children and estates in land;” for these were looked upon as so many pledges for their good behaviour; without which they thought it dangerous to entrust them with the management of public affairs.

Polygamy was not commonly tolerated in Greece, marriage being thought the conjunction of one man with one woman: whence some will have γάμος derived παρὰ τὸ δύο ἀνα εἰναι from two becoming one. When *Herodotus* reports, that *Anaxandrides*, the *Spartan*, had two wives, he remarks it was contrary to the custom of *Sparta*.²¹ The rest of the Grecian cities did, for the most part, agree herein with the *Lacedæmonian*, only upon some emergent occasions; as when their men had been destroyed by war or other calamity, toleration of this sort was permitted for marrying more wives, an instance whereof we have at *Athens*, in the time of *Euripides*, who, as some say, conceived an hatred against the whole sex, for which he is infamous in story, and from being harassed with two wives at once.²² *Socrates* is also said to have been married to *Xantippe* and *Myrto* at the same time:²³ and *Athenæus* concludes it was then reputed no scandal, because we never find any of his enemies reproaching him with that transaction.²⁴ Though this report has been questioned; and in the opinion of *Plutarch*, *Panetius* of *Rhodes*, in ιναρώς ἀντείρητε, has fully confuted it in his discourse concerning *Socrates*.²⁵

The time of marriage was not the same in all places. The *Spartans* were not permitted to marry till they had arrived at their full strength.²⁶ Although the exact number of years is not accurately ascertained, yet it appears, from one of the institutions of *Lycurgus*, that both men and women were limited in this affair: on that legislator being asked the rea-

¹⁹ *Athenæus*, lib. xiii.

²⁰ *Dinarchus in Demosthenem.*

²¹ Lib. v.

²² *Gellius, Noct. Attic*, lib. xv. cap. 20.

²³ *Diog. Laërtius Socrate.*

²⁴ Lib. xiii.

²⁵ *Plutarchus Pericle.*

²⁶ *Xenophon de Repub. Lacedæmon.*

son, he said, his design was, that *Spartan* children should be strong and vigorous.

The *Athenian* laws are said to have ordered that men should not marry till above thirty-five years of age, for human life being by *Solon* divided into ten weeks, (*εξδομάδες*,) he affirmed, *in harum hebdomadum quinta maturitatem ad stirpem reliquendam homini inesse*; that in the fifth of these weeks men were of ripeness to multiply their kind;²⁷ but this depended upon the opinion of the legislator, nothing being generally agreed to: in this matter *Aristotle*²⁸ thought thirty-seven a good age; *Plato* agreed to thirty; of which opinion was also the judgment of *Hesiod*, who thus advises his friend.

Ωραῖος δὲ γυναικα τεὸν ποὺς οῖκον ἄγεσθαι,
Μῆτε τρὶποντων ἐτέων μάλα πολλά ἀπολείπων,
Μῆτ' ἐπιθεὶς μάλα πολλά γάμος δέ τοι ὥρος ζῆται.²⁹

“ The time to enter on a married life
“ Is about *thirty* then bring home a wife;
“ But don’t delay too late, or wed too young,
“ Since strength and prudence to this state belong.” J. A.

Women married sooner than men. Some of the old *Athenian* laws permitted them to marry at twenty-six. *Aristotle* at eighteen; and *Hesiod* at fifteen.

Η δὲ γυνὴ τέτορδη ἡξώη, πέμπτω δὲ γαμοῖτο.³⁰
“ A wife when *fifteen* choose, then let her wed,
“ She’ll then enjoy the rapturous marriage bed.”

POTTER.

It is observed, that the poet advises four years after ten, presuming he meant they must continue unmarried for four years after the attainment of woman’s estate, and marry in the fifth, *i. e.* fifteen. It has been urged, that the poet’s meaning was for them to remain four years after the fifteen, thereby making it nineteen years. But as it is agreed that women were sooner marriageable than men, so their time was far shorter, it being common for men to marry much older than women could expect to do, as *Lysisistrate* complains in *Aristophanes*.³¹

ΛΥ. Περὶ τῶνδε κορῶν ἐν τοῖς θαλάμοις γηρασκούσῶν ἀνιῶματι.

ΠΡ. Οὐκεν γένδρες γηράσκουσιν;

ΛΥ. Μὰ δέ αλλά ζητεῖπας ὅμοιον.

Ο γὰρ ήκαν μὲν, καὶν ἡ πολιὸς ταχὺ παιδα πόρην γεγάμηκεν.

Τῆς δὲ γυναικὸς μικρὸς ὁ καιρὸς καὶν τέτο μὴ πιλάσηται

Οὐδεὶς ἐθέλει γῆματα ταύτην, οττευομένη δὲ κάθηται.

²⁷ Plutarchus Pericle.

²⁸ Polit. lib. vii. cap. 16.

²⁹ Egy. καὶ Ημέρ, β', 313.

³⁰ Ibid. 316.

³¹ Lysisistrate.

“ LY. 'Tis some concern to me, when I reflect
 “ On the poor girls that must despair of man,
 “ And keep a stale and loathed celibacy.
 “ PR. What, han't the men the same hard measures then?
 “ LY. Oh! no, they have a more propitious fate,
 “ Since they at sixty, when their vigour's past,
 “ Can wed a young and tender spouse, to warm
 “ Their aged limbs, and to repair their years:
 “ But women's joys are short and transient;
 “ For if we once the *golden minutes* miss,
 “ There's no recalling, so severe's our doom;
 “ We then must long in vain, in vain expect,
 “ And by our ills forewarn posterity.”

J. A.

And although the Greeks abhorred incestuous connections, the Persians, (whom they regarded as barbarians,) permitted those intermixtures, insomuch as their most sacred of persons, the *Magi*, were the produce of unnatural unions. The Lacedæmonians strictly prohibited such connections. There is a remarkable instance in Grecian history of one *Byblis*, who fell in love with her brother *Caunus*, who, notwithstanding the greatness of her passion, she confessed she could find no precedent to sanctify such criminal desires. Though she confesses if she dared aspire to the examples of their theogony, she could find plenty of precedents in *Saturn*, *Jupiter*, &c.; but she was not content to sully a fair fame to follow their example. In most of the Grecian states, who made any figure, it was customary for citizens only to marry with the daughters of citizens. In the infancy of Grecian society it was usual for men to purchase their wives;³¹ of this we have also an example in Jewish history, where the son of Hamor, Shechem, was desirous to marry Dinah, the daughter of Jacob. Shechem said, “ Ask me ever so much dowry, and I will give according as ye shall say unto me, but give me the damsel for wife.”

In Greece, the consent of the parents were necessary, and of the mother as well as of the father, whence *Iphigenia* was not to be given to *Achilles*, until *Clytemnestra*'s consent was procured, as we are informed by *Euripides*:—*Iphigen. in Aulid.* Years of maturity made no distinction in this

³¹ Agamemnon, in the *Iliad*, lib. ix. when on the point of despatching an embassy to Achilles, and enumerating the presents he proposes to make, adds, after an intention is mentioned to give him either of his daughters,

“ I yield him those whom most his eyes approve,
 “ I ask no presents, no reward for love,
 “ Myself will give the dow'r, so vast a store
 “ As never father gave a child before.”

POPE.

M. P. J. Von Shaklenberg observes, “ the *Jakuti*, like other pagans, allow of polygamy; they buy and sell their wives, as is customary among the *Tartars*, *Ostiacks*, and all their neighbours; where the bridegroom is obliged to purchase the bride of her parents.”—*Historiographical Description of the North-east of Europe*, &c. p. 383. Anno 1730.

respect, for we find *Achilles* refusing the daughter of *Agamemnon* in the *Iliad*, on the pretence that he left that to his father.

*Ὕπερ δέ με σώσοι θεοί, καὶ οὐκαδέ τίνωμαι,
Πηλεύς δέν μοι ἐπειδα γυναικα γαμέσσεται αὐτός.*

“ If heaven restore me to my realms with life,
“ The reverend *Peleus* shall elect my wife.”

Il. ix. 516. POPE.

And in *Terence*, *Pamphilus* is betrothed by his father *Simo*, whom the poet introduces speaking thus, in *Andriæ*, act. i. sc. 1.

— *hác famá impulsus Chremes
Ultro ad me venit, unicam gnatam suam
Cum dote summa filio uxorem ut daret;
Placuit; despondi; hic nuptiis dictus est dies.*

“ Chremes seduced by this fine character,
“ Came of his own accord to offer me
“ His only daughter, with a handsome portion
“ In marriage with my son. I lik'd the match;
“ Betroth'd my son; and this was pitch'd upon,
“ By joint agreement, for the wedding-day.”

COLMAN.

Virgins who had no parents, or, at least, no fathers, were usually disposed of by their brothers. Thus *Creon* promises his sister *Jocasta* to any person who would destroy the *Sphinx* which infested *Thebes*: *Orestes*, also, gave his sister *Electra* to his friend *Pylades*. When they had neither parents nor brethren, or should their brothers not be yet arrived at years of discretion, or be otherwise incapacitated, their disposal was usually made by their grandfathers, those of the father's side being usually preferred. When these failed, their disposition was made by their guardians, called *επίτροποι*, or *πύριοι*.³² Sometimes husbands betrothed their wives upon their death-beds, as appears from the story of *Demosthenes*' father, who, when he was near death, gave his wife *Cleobule* to one *Aphobus*, who took the portion but refused to marry the woman; whereupon *Demosthenes* made his complaint to the magistrates, and accused him in an elegant oration.³³ That this custom was not unusual, appears from the same orator's defence of *Phormio*, who being a slave, and faithful in his business, his master gave him liberty and his wife.

They had several forms of betrothing, such as this, cited by *Clemens of Alexandria*,³⁴ out of *Menander*, *Παίδων σπόρῳ τῶν γυναικῶν διδωμί σοι τὴν ἐμαυτὴν γυνατέρα*. i. e. *I give you this my daughter, to make you father of children lawfully begotten.* The dowry was sometimes mentioned, as we find in *Xenophon*,³⁵ where *Cyaxares* betrothes his daughter to *Cyrus*.

³² Demosthenes in Stephanum testem.

³⁴ Stromat. lib. ii.

³³ Orat. in Aphobum.

³⁵ Cyprian. lib. viii

Δίδωμι σοι, ὦ Κύρε, αὐτὴν τὴν γυναικαν θυγατέρα τε ἡσαν ἐμὴν, ἐπιδίδωμαι δὲ αὐτὴν ἐγὼ καὶ φερνὴν Μηδίαν πᾶσαν. i. e. *I give you, Cyrus, this woman, who is my daughter, with all Media for her dowry.* The persons to be married plighted their faith to each other, or to their relations. Thus *Clitophon* and *Leucippe* swear to each other,³⁶ the former to be constant and sincere in his love, the latter to marry him and make him master of all she had. *Ovid* makes the next ceremony after betrothing, the virgin's oath to her lover.

Promisit pater hanc, hæc et juravit amanti.

“ Her father promised, she an oath did take

“ Her faithful lover never to forsake.”

POTTER.

The ceremony in promising fidelity was kissing each other, or joining of their right hands, which was the usual form of ratifying all agreements. Hence *Clytemnestra*, in *Euripides*, calls for Achilles' right hand, to assure her of his intention to marry her daughter.³⁷

Δεξίαν γ' ἐμῇ χεῖρα
Σύναψον, ἀρχὴν μακαρίαν νυμφευμάτων.

“ Join your right hand to mine, a sacred tie

“ Of this our compact.”

POTTER.

Many more instances might be given, were not those already adduced, conceived sufficient; but thus much may be observed, that after civility and good manners came to be established in any place, the usual practice of purchasing wives was laid aside;³⁸ then, upon the contrary, it was usual for wives to bring a dowry.³⁹ Accordingly, we find the most essential distinction between *γυνὴ* and *παλλακὴ*, wife and concubine, consisted in this,—wives generally bringing dowries, and concubines coming without; whence one in *Plautus*, the scene of whose actions lie often in *Greece*,⁴⁰ thus speaks:

Sed ut inops,
Infamis ne sim, ne mihi hanc famam differant, ne
Germanam meam sororem in concubinatum tibi
Sic sine dote dedisse magis, quam in matrimonium.

“ Though I am low i' th' world, and am but mean,
“ I'll offer some small matter for her dowry,
“ Lest this aspersion should be thrown abroad,
“ That she as *mistress* not as *wife* is to you.”

POTTER.

Hence men who were content to marry wives who had no portion, commonly gave them *προικῶα*, an instrument in

³⁶ Achill. Tat. lib. v.

³⁷ Iphigen. in Aulid. v. 831.

³⁸ Aristotle Politic. lib. ii. cap. 8.

³⁹ Euripid. Medea, 230.

⁴⁰ Trinummo.

writing, whereby the receipt of dowry was confessed. The rest of their distinctions was chiefly founded upon this; for she who had a dowry thought she had a just title to greater freedom with her husband, and also to more respect from him, than such as owed their maintenance to him. Hence *Hermione*, in *Euripides*, is enraged that the captive *Andromache*, should pretend to be her rival in the affections of *Pyrrhus*.⁴¹

Κόσμον μὲν ἀμφὶ πραΐ τρυπέας χλιδῆς,
Στολμόντε χρωτὸς τῶνδε ποικίλων πεπλῶν
Οὐ τῶν Αχιλλέως, ἐδὲ Πηλέως ἀπὸ⁴²
Δόμων ἀπαρχὰς δεῦρ' ἔχοσ' ἀφικόμην.
Αλλ' ἐκ Λακαίνης Σπαρτίατιδος χθονὸς
Μενέλαος ἡμῖν ταῦτα δωρεῖται παῖς
Πολλοῖς σὺν ἔδνοις, ὡς ἐλευθεροσομεῖν,
Τυμᾶς μὲν ἐν τοιοῖσδ' ἀμείβομαι λόγοις.
Σὺ δ' ἔσα δέλη, καὶ δορίκηλος γυνὴ⁴³
Δόμες καλασχεῖν, ἐκβαλλοσ' ἡμας, θέλεις
Τέοδ.—

“ This rich attire, these costly ornaments,
“ My various change of clothes, and all my jewels,
“ Ne'er did *Achilles* or old *Peleus* give;
“ No, they are only kind indulgent tokens
“ Of my dear father's blessing; these I brought
“ From *Sparta*, with a fortune great and noble,
“ To show my quality, and that I might
“ Speak freely, without any slavish curse;
“ And dost thou think, thou *dirty servile woman*,
“ To paramount, to cast me out, and gain
“ Th' ascendant o'er my lord's affections.”

J. A.

The Spartan legislator was so careful on this subject, fearing the inconveniences which might arise therefrom, that partly from apprehension lest wives should be inclined to domineer or assume too much over their husbands; and lest the men should make choice of wives from their purse, rather than for their persons, and also that no woman's state should preclude her the benefit of connubial felicity,—he banished dowries out of *Lacedæmon*. *Solon*, likewise, at Athens, agreed with *Lycurgus* in this particular: permitting the Athenian wives to have a little inconsiderable household stuff, and three suits of clothes; for which *Plutarch* assigns this reason: “ He would not have marriages for gain or an estate, but for pure love, kind affection, and to get children.”⁴² But there are people who affirm that this ordinance had no relation to dowries, but only to gifts which

⁴¹ Euripidis *Andromache*, 147.

⁴² *Plutarchus Solone*.

the bride brought with her, called *ἐπαύλια*, which consisted of golden vessels, beds, couches, plates, ointment-boxes, combs, sandals, and all such necessaries for house-keeping, which were usually carried in great state to the house by women, who followed a person called *κανηφόρος*, from carrying a basket, in the usual manner of processions, before whom went a boy in white apparel, with a torch in his hand. It was also customary for the bridegroom and his friends to give presents to the bride, which they called *ἀναπλυπλήρια*.⁴² And that *Solon* did not prohibit dowries appears hence, that men who had no sons, were allowed to entail their estates upon their daughters; and every heiress (which the Athenians called *ἐπικληροί*) was obliged to marry her nearest relation, lest her estate should go out of the family. In consideration of *her* estate or dowry, she had the privilege, when her husband was impotent, to lie with *his* nearest kinsman, that the children might be of the same family; which law was established against those who would match heiresses for portion's sake, and use the cover of law to violate nature. Such husbands were also obliged to lie with their wives *thrice* a month. When there were orphan virgins without inheritance, whom they termed *Ὥησσαι*,⁴⁴ he who was the next in blood, was obliged to marry her himself, or settle a portion according to his quality, if he was *Πεντακοσιομεδίμος*, one of the first rank, 5 minæ, or 500 drachms; if *Ιππεύς*, of the second rank, 300; if *Ζυγίτης*, or third rank, 150; but, if she had many relations equally allied, they all contributed their proportion to raise that sum. If there were more than one virgin, their nearest kinsman was obliged to marry, or give a portion to one of them: on his refusal to do this, any person was to indict him before the *Archon*, who obliged him to do his duty. Should the *Archon* refuse to put the law in execution he was fined 1000 drachms, which was consecrated to *Juno*, the goddess of marriage.⁴⁵

Terence, who laid many of his scenes in Athens, frequently describes the usages of that city. Thus in *Phormio*:⁴⁶

*Lex est, ut orbæ, qui sint genere proximi,
Eis nubant, et illos ducere eadem hæc lex jubet.*

“ It's an establish'd form in *Attic laws*,
“ That the next *male kinsman*, without demur,
“ Must be t' an orphan girl in wedlock join'd.”

⁴² Suidas.

⁴³ Plutarchus Solone.

⁴⁴ Eustathius in *Iliad*, ex *Aristophane Grammatico*.

⁴⁵ Demosthenes *Orat. ad Macartatum de Hagianâ hæreditate*.

⁴⁶ *Act. i. sc. 2.*

In the same comedy, he afterwards expresses the five *minæ* given by men of the first quality.

*Etsi mihi facta injuria est veruntamen
Potius quam lites secter, aut quam te audiam
Itidem ut cognata si sit, id quod lex jubet
Dotem dare, abduce hanc, minas quinque accipe.*

“ Though I’ve been herein bubbled, here’s the sum,
“ *Five minæ*, as the law enjoins, and take her
“ As my kinsman; this I’ll rather do
“ Than sacrifice my patience to your talk,
“ Or enter once the clutches of the law.”

J. A.

After money became more plentiful, *Eustathius* informs us the *Πεντακοσιομεδίμοι* gave 10 *minæ*; when it is presumed men of inferior quality also raised their contributions.

When virgins had no relations to provide for them, and were descended from men who had served the state, it was usual for the commonwealth to take care of them: a remarkable instance of this we have in the two daughters of *Aristides*, to each of which the city gave 300 drachms for her portion. It is not to be wondered at, saith our author, that the Athenians should take care of those who lived in their city; when they heard the grand-daughter of *Aristogiton*, one of the two patriots who opposed *Pisistratus*’s sons, was in a low condition, in the isle of *Lemnos*, and likely to want a husband, because without a portion, they sent for her to Athens, married her to a person of great quality, and gave her a farm belonging to the city for a dowry. The Athenians, whilst poor, were governed by noble principles; but after an influx of wealth had injured those virtuous feelings, they, like the modern inhabitants of this our isle, paid too great an homage to wealth, to which they, with the more virtuous *Spartans*, became the slaves of this prevailing passion, to the destruction of the more valuable part of the Attic character. Widows without children, and wives which were divorced also, when the heir of the party, whose possessions he enjoyed, did not choose to maintain the relict of the absent or lost possessor, had their dowries returned to them. This may be learnt, in part, from the *Odyssey* of Homer, with respect to *Penelope*: *Telemachus*, her son, having sustained losses by his mother’s gallants, in the protracted absence of his father, would, he says, have returned her to her parents, but that he could not raise the dowry.

————— κακὸν δὲ με πολλά ἀποτίνειν
Ικαρίω, αἴν’ αὐτὸς ἐκὼν ἀπὸ μητέρα πέμψω.

“ I could not now repay so great a sum
 “ To the old man, should I dismiss her home
 “ Against her will.”——

POTTER.

Which intimates that if the woman departed of her own accord the obligation became void. Yet if a woman departed from her husband, according to the permission of the laws, her dowry was restored to her. Also, when any man's estate was confiscated, it was customary at Athens that the wife's dowry should be assigned to her.

A custom also prevailed in that city, that he who did not restore to his wife, when divorced, her dowry, was obliged to pay her nine *oboli* every month whilst it was detained, as the interest of the money he withheld. This, however, is, we presume, properly understood to respect the lowest class of citizens only, to whom *Solon* allowed 150 drachms; for it being customary for one *μνᾶ*, which is equivalent to 100 *drachmæ*, to produce an interest of six *oboli* per month; the interest of 150 *drachmæ*, therefore, must, consequently, amount to NINE *oboli* per month.

Before men married, it was usual to provide themselves a house: they generally built a new one; which practice *Homer* frequently alludes to; *Hesiod* also gives this advice, in allusion to this custom:

Οἶκον μὲν πρώτιστα, γυναικά τε——

“ First see you have a settlement, and wife.”

POTTER.

The woman in *Theocritus* asks her lover whether he was making a house ready for her:

Τεύχεις θαλάμους, τεύχεις καὶ δῶμα, καὶ αὐλάς;
 “ What, are you furnishing a house? Have you
 “ Provided beds?”

POTTER.

To which he replies,

Τεύχω σοι θαλάμους.——
 “ Beds I'll procure, don't fear.”——

POTTER.

Protesilaus, in *Homer*, being called to the *Trojan* war, soon after his marriage, is said to have left δόμον ἡμίελῆ, his house half finished.

Τῷ δὲ καὶ ἀμφιδρυφῆς ἄλλοχος Φύλακη ἐλέλειπτο,
 Καὶ δόμος ἡμίελῆς.——
 “ At Phylace he left behind his spouse,
 “ There to lament in an half-finish'd house.”

POTTER.

Though some will have *oīkos* to mean his family, which is called ἡμίελῆς, because he left it before he had any

children.⁴⁷ The selfsame ambiguity is found in *Valerius Flaccus*, who has thus imitated Homer:

— *conjux miseranda, Caico,*
Linguitur et primo domus imperfecta cubili.

“ Near where *Caicus*’ silver stream doth glide,

“ His solitary house and wife abide,

“ Unblest with offspring of the bridal night,

“ Who might solace the thoughts, the pensive mind delight.”

J. A.

Catullus hath expressed the same thought:⁴⁸

Conjugis ut quondam flagrans advenit amore,
Protesilaëam Laodamia domum.

Incepitam frustra, nondum cum sanguine sacro
Hostia cælestes pacificasset heros.

“ As fair *Laodamia* once did come

“ Inflamed with passion to th’ unfinished home

“ Of her dear lord, before the sacrifice

“ Had e’er appeas’d the heavenly deities.”

J. A.

But the former sense seems most agreeable to the way of speaking in those times; besides it was customary to build an house before marriage: thence women, whose husbands died soon after marriage, are said to be left *widows in a new-built house*; as the Greek scholiast observes on this verse of *Homer*:⁴⁹

Χηρώσας δὲ γυναικα μυχῷ θαλάμοιο νέοιο.

It was also customary, in the performance of their religious rites, for the *Athenian* virgins to be presented to *Diana*, before it was lawful for them to marry. This ceremony was performed at *Bauron*, an Athenian borough: and it was called *ἀρπεία*, the virgins themselves *ἀρπῆι*, and the action *ἀρπεῖα*, the custom being instituted to appease the goddess, who had been incensed against some of the Athenians for killing a bear. Another custom was, for virgins, on becoming marriageable, to present certain baskets full of little trinkets and curiosities to *Diana*, to gain leave to withdraw themselves from her protection, (they being looked upon as the goddess’ peculiar care,) and to change their state of life. To which custom *Theocritus* alludes:

Ηνθ’ ἀ τῷ Εὐβοέλοιο καναφόρος ἄμυντιν Αναξῶ
 Αλσος ἐπ’ Αγλέμιδος.

Anaxo, Eubul’s daughter, full of love,
Came with a basket for Diana’s grove.

POTTER.

This action was called *κανηφορεῖν*, and the virgins *κανηφόροι*, from the baskets they carried.

⁴⁷ Scholiastes *etus in loc. cit.*

⁴⁸ Epigram. *ad Mallium.*

⁴⁹ Iliad *ρ*, v. 36.

We find *Diana* concerned in the preparatory solemnities before all marriages. As a married life was her aversion, it was thought requisite, for all who entered upon it, to ask her pardon for dissenting from her. This was done by prayers and several sorts of sacrifices. When *Agamemnon*, in *Euripides*, pretending he was going to match *Iphigenia* with *Achilles*, speaks thus to *Clytemnestra*:

Ἐκπεμπε παῖδα δωμάτων παῖδος μέτα,
 'Ως χέρνισες πάρεισιν ηὐτρεπισμένας,
 Προχύται τε βάλλειν πῦρ καθάρειον ἐκ χερῶν,
 Μόσχοι τε, πρὸ γαμων ἀς θεῷ πεσεῖν χρεῶν
 'Αρτέμιδι, μέλανος αἴματος φυσήματα.

“ Send *Iphigenia* quickly forth with me,
 “ *Hymen* is now propitious, all things wait
 “ To grace the solemn gladness of the day,
 “ The holy water’s ready, with the cakes,
 “ To cast upon the fire; the *calves* are brought,
 “ Whose blood in grateful vapours must arise
 “ T’ attone the breach of chaste *Diana*’s rites.”

J. A.

These were called *γαμήλιοι εὐχαὶ προγάμεια, προτέλειοι εὐχαὶ*, or *προτέγεια*, for *τέλος* and *γάμος* are terms of the same signification,⁵⁰ the former denoting marriage, either as a general name, for all sorts of rites and ceremonies; or, as some say, because the longing expectations of married persons are thereby consummated, and brought to an end; or, because persons who are married become complete and perfect, and renounce all the customs, desires, and follies of childhood: whence *γῆμαι*, to marry, is termed *τέλειωθῆναι*, to be made perfect.⁵¹ Married persons are called *τέλειοι*,⁵² and are said to be *ἐν βίῳ τέλειῳ*. The same epithet is commonly given to the gods that had the care of marriage, whence we read of *Jupiter τέλειος, Juno τελεία*,⁵³ &c. These gods were likewise rendered propitious before the nuptials; and sacrifices with other devotions were offered them, which were all known by the same names with those offered to *Diana*: *Juno*’s were called, (besides their general name,) *Ηρατέλεια*, from her own name, which in Greek is *Ηρα*. Several other deities had their share in these honours: *Minerva*, surnamed *Παρθένος*, the *virgin*, had a peculiar title to them at *Athens*, upon the same account they were paid to *Diana*; and it was not permitted a virgin to marry, till she had paid her devotion to this goddess, in the citadel.⁵⁴ *Venus*, likewise, and all the rest of the *γαμήλειοι*

⁵⁰ Eustathius in Iliad. *§1.*

⁵¹ Eustathius in Iliad. *μ'.*

⁵² Bisetus in Aristoph. *Thesmophor.*

⁵³ Suidas, aliique complures.

⁵⁴ Suidas, &c.

Ὥσοι, gods superintending marriage, were invoked.⁵⁵ The Lacedæmonians had a very ancient statue of Αφροδίτη Ήρα, i.e. *Venus Juno*, to which all mothers sacrificed when their daughters were married.⁵⁶ The most ancient Athenians sacrificed to Heaven and Earth, which were believed to have a particular concern in marriage; the latter of these being rendered fruitful by the benign influence of the former,⁵⁷ therefore a fit emblem of marriage. The Fates and Graces were thought first to join, and then preserve the tie of love, and were partakers of like respect;⁵⁸ and it is probable, that several other deities, at different times, and for various reasons, claimed a share therein. The day whereon this ceremony was performed, was usually that which preceded the day of marriage;⁵⁹ it is commonly called γαμηλία ηγρεῶτις,⁶⁰ from the presentation of their hair to *Diana* and the fatal sisters.

There were also certain other local customs in particular places, but what has appeared may suffice.

Potter also cites a discourse from Euripides, *Iphigen.* in Aulid. v. 7, 8. which brings him to speak of the ceremonial portion of the sacrifice upon this solemn occasion; wherein he tells us, that it was usual to throw the *gall* of the animal behind the altar,⁶¹ being the seat of anger and malice, and therefore the aversion of the deities who had the care of love, as well as of those who became their votaries. The entrails were carefully inspected by soothsayers, and if any unlucky omen presented itself, the former contract was dissolved, as displeasing to the gods, and the nuptials prevented. The same happened upon the appearance of any ill-boding omen without the victim: thus we find in *Achilles Tatius*, that *Clitophon's* designed marriage with *Calligone* was hindered by an eagle snatching a piece of the sacrifice from the altar.⁶² The most fortunate omen which could appear was a couple of *turtle-doves*, because of their inviolable attachment: the same may be also said of *κορώναι*, which were thought to promise long life, the length of their lives being proverbial, and the perpetuity of their love equally remarkable, and alike well known; for, when one of the mates is dead, the other remains solitary ever after:⁶³ for which reason the appearance of those birds single, boded separation or sor-

⁵⁵ *Etymologici de Archiepiscopus Potter.* ⁵⁶ *Pausanias Laconicis.*

⁵⁷ Proclus in *Timæum Platonis Comment.* v.

⁵⁸ *Pollux*, lib. iii. cap. 3. *Etymologici Potteri*, v. γαμηλία

⁵⁹ *Hesychius.*

⁶⁰ *Etymologici Potteri.* ⁶¹ *Cœlius Rhodigin.* lib. xxviii. cap. 21. *Plutarchus de conjugial. præcept.*

⁶² Lib. ii.

⁶³ *Alex. ab Alex.*

row to the married couple; whence, as we are told by *Horapollo*, it was customary at nuptials to sing Κόρη ἐπιόρει πορών, whereby the maids were put in mind to watch, that none of these birds came single to disturb the solemnity; or to divert the pernicious influence of the unlucky omen, if it happened to appear. Another remedy against evil omens on these and other occasions was this, they wrote over their house-doors ΜΗΔΕΝ ΕΙΣΙΤΩ ΚΑΚΟΝ, “LET NO EVIL ENTER.” To this sentence they sometimes joined the name of the master of the house, as

Ο ΤΟΥ ΔΙΟΣ ΠΑΙΣ ΗΡΑΚΛΗΣ ΚΑΛΛΙΝΙΚΟΣ
ΕΝΘΑΔΕ ΚΑΤΟΙΚΕΙ, ΜΗΔΕΝ ΕΙΣΙΤΩ ΚΑΚΟΝ.

“*Here dwells Hercules, the victorious son of Jupiter, let no evil enter.*” An inscription of this kind is said to have afforded the witty cynic *Diogenes* an opportunity to say, “*Then let not the master of the house enter:*”⁶³ the possessor being a vicious kind of person.

The bridegroom’s garments were all dyed, as *Suidas*⁶⁴ has observed out of *Aristophanes*. However that be, both the married persons and their attendants were richly attired according to their quality.

Σοὶ δὲ γάμος σχεδὸν ἦν, ἵνα χρὴ παλὰ καὶ αὐτὴν
Εἴματα ἔννυσθαι, τα δὲ τοῖς παρασχεῖν, οἵ κέ σ' ἀγωνται.

“ The time was nigh completed, when a bride
“ You was to be, and richly drest in clothes,
“ With your attendants, on that solemn time.”

POTTER.

They were likewise decked with garlands of various herbs and flowers; whence *Clytemnestra*, in *Euripides*, speaks thus to *Achilles* about her daughter *Iphigenia*:⁶⁵

Αλλ' ἄμυνον ὡς θεᾶς παῖ, τῇ τ' ἐμῷ δυσπραξίᾳ,
Τῇ τε λεχθείσῃ δάματει σῆ, μάτην μὲν, ἀλλ' ὅμως
Σοὶ παταξέψασ' ἐγώ νιν ἦγον ὡς γαμψένην.

“ Thou darling offspring of a goddess, help,
“ Pity, redress, avenge my woeful loss,
“ In my dear child, thy wife; but oh! in vain,
“ Though I had crown’d her, to be wedded to thee.”

The herbs were usually such as signified the affairs of marriage, as those sacred to *Venus*, or which are mentioned by the *scholiast*⁶⁶ upon *Aristophanes*, σισύμβριον, μήκων, σήσαμον, &c. Cakes made of *sesame* were also given at marriages; that herb being πολυγόνος, *remarkably fruitful*; also perhaps, because it was a fruit earlier reared than wheat, and was sacred in the *Eleusinian* mysteries. The *Bœotians* used gar-

⁶³ *Diogenes Laërtius* in *Diogene.*

⁶⁴ *V. Βαπτά.*

⁶⁵ *Iphigen.* in *Aulid.* v. 903.

⁶⁶ *Pace.*

lands of wild *asparagus*, which is full of prickles, but bears excellent fruit, and was therefore thought to resemble the bride, who had given her lover some trouble in gaining her affections, which she recompensed afterwards by pleasant conversation. The house where the nuptials were celebrated was likewise decked with garlands; a pestil was also tied upon the door; a maid carried a sieve,⁶⁷ the bride bearing φρύγετον, φρυγετρον, or φρύγητρον,⁶⁸ an earthen vessel, wherein barley was parched, to imply the necessity of her obligation to attend to the duties of her family.

The bride was usually conducted in a chariot from her father's house, in the evening, to that of her husband,⁶⁹ that time being chosen to conceal her blushes; thus we find from *Catullus's Epithalamium*:

*Vesper adest, juvenes consurgite, vesper Olympo
Expectata diu vix tandem lumina tollit;
Surgere jam tempus, jam pingues linquere mensas:
Jam veniet virgo, jam dicetur Hymenaeus.*

“ Wish'd evening's come, ye youths assembled rise!
“ The long expected evening has shut out
“ The light of heaven: now it is time to rise,
“ Now it is time to leave the jovial board;
“ Here comes the lovely bride; now chaunt the song,
“ The hymeneal song.”—

C. S.

At the feast, it is presumed, she was placed in the middle, her husband sitting on one side, and one of his most intimate friends on the other, who for that reason was called πάροχος. This custom was so frequent, that when the bride went to her husband's home on foot, the person who accompanied her retained the same name, and was accordingly called νυμφευτής, παρανυμφος, and παράνυμφος,⁷⁰ though this name appears to be most commonly used in the feminine gender, and properly signifying the woman who waited upon the bride, sometimes called νυμφεύτρια. When the bridegroom had been previously married, he was not at liberty to fetch the bride from her father's house, but that care was entrusted to one of his friends, termed νυμφαγωγός,⁷¹ or νυμφοστόλος, which words are likewise taken for the persons who assisted in making up the match and managing the concerns which related to the marriage, who, if women, were called προμήστριαι, προξενήτριαι, &c. One thing farther may be observed in the bride's passage to her husband's

⁶⁷ *Pollux*, lib. iii. cap. 3. ⁶⁸ *Idem*. lib. i. cap. 12. *Hesychius*.

⁶⁹ *Suidas*, v. Ζεῦγος. *Eustathius*, *Iliad*, λ'. p. 765.

⁷⁰ *Hesychius*, v. Νυμφαγώγος.

⁷¹ *Hesychius*, vide *Pollucis Onomast.* lib. iii. item *Suidam*, *Phavorinum*, cæterosque *Lexicographos*.

house, *viz.* that torches were carried before her, as appears from the messenger in *Euripides*, who says, he calls to mind the time when he bore torches before *Menelaus* and *Helena*:⁶⁸

Νῦν ἀνανεῖμαι τὸν σὸν ὑμέναιον πάλιν,
Καὶ λαμπάδων μεμνήμεθ' ἀς, τετραόροις
Ἴπποις τροχάζων, παρέφερον· σὺ δὲ ἐν δίφροις
Σὺν τῷδε νύμφῃ δῶμι ἔλειπες ὅλειον.

“ I call to mind, as yesterday, the pomp
“ Of your procession on the wedding-day,
“ How you were carried in a coach and four,
“ While I with torches blazing in the air,
“ Drove foremost on from your dear parent’s home;
“ That happy nursery of your tender years.”

J. A.

These torches were usually carried by servants, as appears from those words in *Hesiod*:⁶⁹

Τῆλε δὲ ἀπ’ αἰθομένων δαῖδων σέλας εἰλύφαξε
Χερσὶν ἐνὶ δμώων.

“ The servants then, did flaming torches bear,
“ Which darted forth a quivering light from far.”

Sometimes they were attended with singers and dancers, as Homer acquaints us in his description of the shield of Achilles:⁷⁰

Ἐν δὲ δύω ποίησε πόλεις μερόπων ἀνθρώπων
Καλάς· ἐν τῇ μέν ῥα γάμοι τ’ ἔσταν, εἰλαπίνατε,
Νύμφας δὲ ἐν θαλάμων, δαῖδων ὑπὸ λαμπομενάων
Ὕγινεον ἀνὰ ἄσυ· πολὺς δὲ ὑμέναιος ὁράρει.
Κέροι δὲ ὁρχητῆρες ἐδίνεον, ἐν δὲ ἄρα τοῖσιν
Αὐλοῖ, φόρμιγγές τε βοὴν ἔχον· αἱ δὲ γυναικες
Ιστάμεναι θαύμαζον ἐπὶ προθύροισιν ἐκάστη.
“ Two cities radiant on the shield appear,
“ The image one of peace, and one of war:
“ Here sacred pomp and genial feast delight,
“ And solemn dance, and Hymeneal rite;
“ Along the street the new-made brides are led,
“ With torches flaming to the nuptial bed:
“ The youthful dancers in a circle bound
“ To the soft flute, and cittern’s silver sound:
“ Through the fair streets the matrons in a row
“ Stand in their porches, and enjoy the show.”

POPE.

The song they were entertained with in their passage,

⁶⁸ Helen. v. 728.

⁶⁹ Scut. Hercul. v. 275.

⁷⁰ Iliad, σ', v. 490.

was called ἀρμάτειον μέλος, from ἀρμα, the coach they rode in, the axle-tree whereof they burnt when arrived at their journey's end, thereby signifying that the bride was never to return to her father's house. The *Rhodians* had a most peculiar custom, of sending for the bride by a public crier. When the bride and bridegroom entered the house, it was usual to pour upon their heads figs and divers other sorts of fruits, as an omen of future plenty. The day of the bride's departure from her father's was celebrated in manner of a festival, and called Προσχαιρητήρια.⁷¹ It seems to have been observed at her father's house before she departed, being distinct from the nuptial solemnity, which was kept at the bridegroom's house, and began at evening, the usual time of the bride's arrival there.

The bride, being come to the bridegroom's house, was entertained with a sumptuous banquet, called by the same name with the marriage, γάμος, as *Pollux* hath observed from the following verse in Homer:—

Εἰλαπὶν, ἡὲ γάμος, ἐπεὶ ὅκ ἔρανος τὰ δέ γ' ἵειν.

“ A shot-free banquet or a marriage feast,

“ Not such as is by contribution made.”

POTTER.

Whence δαίειν γάμον is to make a nuptial entertainment. Thus Homer.⁷²

————— δαίσειν δὲ γάμον μετὰ Μυρμιδόνεσσι.

“ To make a marriage feast for the Myrmidons.” POTTER.

The same poet hath similar expressions in other places.⁷³

————— δαίνυντα γάμον πολλοῖσιν ἔτησιν.

“ Making a nuptial banquet for his friends.”

POTTER.

What was the design of this entertainment we learn from *Athenæus*, who (to pass by the joy and mirth of it) tells us there were two reasons for it: the first was the respect due to the gods of marriage, who were invoked before the feast, and had no small share in it; and it is thought by some that most *Grecian* festivals were first observed on this ground. The second end of this marriage entertainment was, that the marriage might be made public,⁷⁴ for all relations of the married couple to witness the solemnity, and to rejoice with them: whence the young man in *Terence* concludes, the marriage he there speaks of could not be presently consummated, because time was requisite for that purpose:⁷⁵

⁷¹ *Harpocration, Suidas.*

⁷² *Iliad* τ'.

⁷³ *Odyss.* δ'.

⁷⁴ *Athenæus, lib. v. cap. 1. initio.*

⁷⁵ *Phorm. act. iv. sc. 4.*

*Ducenda est uxor, ut ait; concedo tibi:
Spatum quidem apparandis nuptiis,
Vocandi, sacrificandi dabitur paululum.*

“ That he’s obliged to marry her, I grant;
“ But then some time before must be allow’d
“ For the procuring of all requisites.
“ His friends must be invited to the wedding,
“ And he address the gods with sacrifices.”

H. H.

During the solemnity, the company diverted themselves with music and dancing: we seldom read of a *marriage* without them. All songs upon this occasion were called *ὑμέναιοι* or *ὑμένες*: thus both *Hesiod* and *Homer*:

————— *Πολὺς δ’ ὑμέναιος ὁρώμεται.*

“ Many Hymens sung.—————”

B.

The Romans used the same term.⁷⁵

Hymenæum, turbas, lampada, tibicines.

“ Your Hymens, hubbubs, flambeaus, and flutes.”

W.

This name was taken from the frequent invocations of *Hymen*, or *Hymenæus*, the god of marriage, which were always made in these songs: as in this verse of *Catullus*.

Io Hymen, Hymenæe, Hymenades, O Hymenæe.

This *Hymenæus*, we are told, was an *Argian*, whom they received into the number of their gods, and thus remembered for a generous action in delivering some *Athenian* virgins from the lust and cruelty of certain *Pelasgians*. The word has been also derived from *ἀπὸ τῆς ὁμοίας ναιεῖν*, from the married couple *inhabiting together*: others, lastly, from *ὑμήν*, which has an anatomical signification. About the time of their entertainment they had several significant ceremonies relating to the connubial state. One at *Athens* was this:—There came in a boy covered with thorn-boughs and acorns, carrying also a basketful of bread, and singing—*Ἐφυγον νανὸν εὗρον ἄμεινον*, i. e. “ I’VE LEFT THE WORSE, AND FOUND THE BETTER!” Which song was also used in one of their most ancient feasts to commemorate their change of diet from acorns, poppy and sesame seeds, to corn;⁷⁶ but, at this time, it indicated that happiness which married persons were entering upon, and seemed to remind them that marriage was preferable to a single life.

Having seen the mode practised by the ancients in court-

⁷⁵ *Terentius Adelph.*

⁷⁶ Vide l’Abbé Pluche, *Hist. du Ciel.*

ship, and brought the ceremony of marriage to a conclusion, we only now observe, without tracing the matter farther, or trespassing longer on patience, that from what has appeared, we may discern that the *Grecian* and *Roman* customs were nearly similar. The latter copied the former so closely, that no material distinction existed. It now only remains to add, that from our own experience we may, speaking with feeling, observe, that we cordially unite in the sentiments of ancient Greece, in believing no state in which man is placed, he can be so happy as in that of CONNUBIAL FELICITY.

FEASTS, FESTIVALS, &c.

We have seen in the last article, that it was the opinion of *Athenæus*, that the origin of *all* festivals was in due honour to their deities. That this cannot be well questioned we would cite numerous authorities to prove, besides the evidence offered by *Homer*, *Hesiod*, and other poets; but the fact chiefly inquired after at present, besides the materials of and order observed at ancient FEASTS, will be as to *the manner in which such feasts were celebrated*. Being unwilling to restrain the inquiry of any; or not ambitious in this, as well as in *ALL other things treated of, to dictate the form to any man's belief, which we declare once for all; and proposing HERE, as well as in other places, only to submit to public opinion a collection of those circumstances which we have read, upon which, we frankly confess, our own opinion has been founded.*

It appears that accubation, or laying down at meals, was a practice observed by many nations of antiquity. The first example to prove this position we cite from the book of *Esther*, (ch. vii.) where it is said, “When the king “ returned into the place of the banquet of women, *Haman* “ was fallen on the bed whereon *Esther* was.” This may establish the fact as observed among the *Persians*.

That it was also general in *Parthia*, we may infer from what is related by *Athenæus*, from *Posidonius*, that “their “ king lay down at meals upon an higher bed than others.” In *Egypt* it was likewise the same custom; for we are informed that in this manner *Cleopatra* entertained *Anthony*. The same authority also assures us, that she prepared twelve *Tρικλίνια*, *Triclinia*, for his reception. That *Triclinia* were used also and for the same purpose in *Greece*, the word itself implieth; the same is also deducible from the *sympo-siacs* of *Plutarch*. Although, in the days of *Aristotle*, it was not the fashion to lay down at refection, we confess, yet that author advises, in his *Political Institutions*, or *Rules*

for educating Youth, that they might not be permitted to hear *Iambics* or tragedies before they were admitted unto *discubency*, or lying down with others at their meals. That the *Romans* also used this custom of position at their meals with many others, is evident from *Lipsius*, *Mercurialis*, *Salmasius*, and *Cicero*, who have expressly and distinctly treated thereof.

Having established this custom, we now inquire into the place of accubation ; the one of which was called *Στιβάδιον*, *Stibadium*, as well as *Στύμνα*, the table carrying the appearance of a half-moon. Its capacity was uncertain, or varying according to circumstances, whereupon it often received the name of *Ηηχακλινον* and *Οντωκλινον*, according to this verse of *Martial* :—

*Accipe Lunata scriptum testudine Sigma
Octo capit, veniat quisquis amicus erit.*

Places of distinction, at a table, varied in several ages, and were dissimilar at various places ; in some, the place of the most honourable person, if not possessed by the master of the feast, was at the top, sometimes on one side, and sometimes on the other. Tables were also set for the accommodation of various numbers, as *Triclinium*, (that is, where there were only three beds about a table;) as the representation thereof will testify, particularly that given in the *Rhamnasan* *Triclinium*, by *Mercurialis* ; and its customary use might be deduced from the almost universal practice of bathing, after which they generally retired to bed, and refected themselves with a repast. By degrees, custom changed their cubicular beds into discubiculary, and introduced the fashion to go from the baths unto these.

As to gesture or position,—the men generally lay down, leaning upon their left elbow, the back being supported by a pillow ; the second with his back towards the breast of the first, his head reaching up near to the pit of the stomach of the preceding ; with the rest in the same order. Women sat or lay sometimes at a separate table, and often promiscuously at that with the men, being herein regulated by either favour or affection, as we are informed by *Juvenal* :

—*gremio jacuit nova nupta mariti.*

We are told by *Suetonius*, of *Caligula*, that infamous wretch, that at his feasts he placed his sisters, with whom he had been incestuously incontinent, successively in order below him.

And as their beds did not usually exceed three, so did not the number of the guests at each table extend beyond that complement ; whence the ancient *proverbial* expression, to *begin with the GRACES, and make up the feast with the MUSES*. And, therefore, it was thought remarkable in the Emperor

Lucius Verus, that he lay down with twelve! which *Julius Capitolinus* assures us was *præter exempla majorum*; not according to the custom of his predecessors, except at public or nuptial suppers. The regular number was also exceeded in the last supper, where there were no fewer in number than *thirteen*. *Josephus* assures us that it was not lawful to celebrate the *Passover* with a less number.

Lastly, as to the disposition and order of the persons invited: the first and middle beds were for the guests, the third and lowest for the master of the house and his family; sometimes more than one lay upon a bed, as he always lying in the last place of the last bed, that is next the middle bed, but if the wife or children were absent, their room was supplied by the *umbræ*, or hangers on, as *Juvenal* thus expresseth it, *Locus est et pluribus umbris*. For the guests, the most honourable place in every bed was the *first*, because by that position he might be next the master of the feast; for the master lying in the first of the last bed, and the principal guest in the last place of the second, they must needs be near each other. The subjoined figure will, perhaps, better explain our meaning; and from whence we may also conceive the feast of *Perpenna*, made unto *Sertorius*; where we read with *Salmasius*: *Igitur discubere, Sertorius inferior in medio lecto supra Fabius; Antonius in summo; infra scriba, Sertorius versius; alter scribas; Mecænas in imo, medius inter Tarquitium et Dominum Perpennam.*

<i>Locus summus</i>	<i>Medius.</i>	<i>Ultimus honoratissimus</i>	<i>Locus summus</i>	<i>Medius.</i>	<i>Ultimus infra.</i>
<i>Perpenna</i>	<i>Mecænas.</i>	<i>Tarquitius.</i>	<i>T. Faubius. Locus Vacus</i>	<i>Medius Lectus. Sertorius.</i>	
<i>Dominus.</i>	<i>Imus Lectus.</i>			<i>Lucius Verus.</i>	<i>Versius.</i>
<i>seu Dominus.</i>				<i>Summus Lectus.</i>	
<i>supra.</i>					

At this feast there were but seven, the middle places of the highest and middle beds being vacant; and where *Sertorius* the general and principal guest was slain; and so we make out from what *Plutarch* saith in his life, “ That, lying “ on his back, and rising himself up, *Perpenna* cast himself “ upon his stomach,” which he might very readily do, being master of the feast, and lying next unto him.

Thus, also, from this tricliniary disposition we can illustrate an expression of *Seneca*, which is considered as somewhat obscure, that “ the north wind was in the middle, the “ north-east on the higher side, and the north-west on the “ lower.” For, as appears from a circular rhomb, the north-east will answer to the bed of *Antonius*, and the north-west that of *Perpenna*.

Also, that the custom of feasting upon beds was in use among the Hebrews, may be deduced from an expression in the prophet *Ezekiel*. “ Thou satest upon a “ stately bed, and a table prepared before it.” Whence the custom of putting off their shoes or sandals, called by old writers *discalceation*, is likewise believed to confirm our observations on this subject; because that practice was conducive to cleanliness; whence also the necessity of the injunction to eat the passover, with their shoes on, and girded up; which would have been useless had not the contrary practice been universal among the Hebrews. However particular nations might, in former ages, differ in these respects from oriental customs, probability favours the surmise, that in subsequent times the habits of the *Assyrians*, with those of other Asiatic nations, were introduced by the *Romans* into Europe, after these nations had become provincial dependencies on its empire. Moreover, that the practice of discumbency at meals was usual at the time of our *Saviour*, is very evident from several passages in the Gospel, wherein that great Being is said to have expressed himself, particularly in the xivth of *Luke*; the vulgar translation runs thus, “ *Cum invitatus fueris ad nuptias, non discumbas in primo loco;*” and *Matthew*, xxiii. when reprehending the Scribes and Pharisees, he saith, “ *Amant protocathedrias, id est primos RECUBITUS in cœnis et protocathedrias sive primas cathedras in synagogis.*” The terms are here definite, clear, and distinct; and the verbal antithesis in the last instance enables us to distinguish very palpably the intention of the divine speaker.

The agreement of the Jewish with Roman ceremonials in other respects renders it probable, they also conformed in this. The Romans washed, were anointed, and wore a cenatory garment:—that the same customs were used in

Judea, may be deduced from numerous practices among that distinct people: for instance, the circumstance mentioned of an expostulation between our Saviour and *Simon*, that he washed not his feet, nor anointed his head with oil, the common civilities at festive entertainments; with the expression concerning a wedding garment, and as some have conceived, of the linen garment of the young man, or *St. John*, which might be the same which he wore at the last supper.

That they used this gesture at the passover is *more* than probable, from the testimony of Jewish writers, and particularly of *Ben-mamion*, recorded by *Scaliger*, in *De emendatione temporum*. After the second cup, according to that institution, the Son asks, “What meaneth this service?” When he who makes the declaration, answers, “How different is this night from all other nights? For all other nights we wash but once,—this night twice: all others we eat leavened or unleavened bread, but this only leavened: all others we eat flesh roasted, boiled, or baked, but this only roasted: all other nights we eat together lying or sitting, but this only lying along.” Which position they used as a token of the security and rest then enjoyed;—far different from that anxious concern we may conceive they laboured under whilst in Egypt; and particularly at the moment when they were on the point of leaving that country. That this gesture was used when our Saviour eat the passover is highly probable, judging from the words of the Evangelists who express that circumstance, which are *ἀνατίτειν, ἀνατίθαι, πατανεισθαι, ανατειδηναι*, which terms properly signify this gesture in *Aristotle, Athenaeus, Euripides, Sophocles*, and all their authors; and the like are met with in the paraphrastical expression of *Nonnus*.

And further if it be not fully considered that this, if not conceded, is now established; and that this gesture was used at the passover; yet that it was observed at the last supper appears incontrovertible; for, at this cenatory convention, more than one supper has been made by the well informed; or if this be not admitted, it has been set out in various ways. The first was the legal one of the passover, or eating the paschal lamb, with bitter herbs, and the other *Mosaic* ceremonies. Of which, it is said, that when he was come, he sat down with the twelve: when it is said, that the supper being ended, our Saviour arose, took a towel, and washed his disciples' feet. The second was common and domestical, consisting of ordinary and undefined provisions; of this it may be said, that our Saviour took his garment

and sat down again, after he had washed his disciples' feet, and performed the ordinary and preparatory civilities of suppers. At this, it is thought, the sop was given to *Judas*, the original word implying some broth or decoction not used at the passover. The third, or latter part, was Eucharistical, which began at the breaking and blessing of bread, according to the text of *Matthew*; “and as they were eating, Jesus took bread and blessed it.”

Although at the passover, or first supper, many have doubted this reclining posture, and some have affirmed that our Saviour stood: yet that he lay down with the other, the same have acknowledged; as *Chrysostom*, *Theophylactus*, *Austin*, and many more. And, if the tradition will hold, the position appears unquestionable; for the very triclinium is seen at Rome, brought thither by *Vespasian*, and graphically given by *Cassalius*.

Thus may it be properly made out, as it is delivered in *John*, xiii. *Erat RECUMBENS unus ex discipulis ejus in sinu JESU quam diligebat.* “Now there was leaning on the ‘bosom of Jesus, one of his disciples, whom Jesus loved;” which gesture will not agree unto the position of sitting; but is natural, and cannot be avoided in the practice of accubation. And the very same expression is found in *Pliny*, concerning the Emperor *Nerva*, and *Veiento* whom he favoured, “*Cenabat Nerva cum paucis Veiento recumbebat proprius atque etiam in sinu;*” and from this custom hath arisen the word *επισηδιος*, that is, a near and *bosom friend*; and, therefore, *Casaubon* justly rejects *Theophilactus*, who, not considering the ancient manner of discumbency, imputeth this gesture of the beloved disciple to rusticity, or an act of incivility. Upon the same principle, the action of *Mary Magdalen* is to be more easily reconcileable, she stood at Christ's feet, behind him, weeping, and began to wash his feet with her tears, and did wipe them with the hairs of her head; which action, if our Saviour sat, she could not perform standing, and had rather stood behind his back than at his feet: and, therefore, those painters who have given pictures of this action, and among them *Raphael Urbin*, where *Mary Magdalen* is depicted before our Saviour washing his feet, on her knees, did not conceive the subject agreeable to its literal truth. Although our translation may appear to discountenance this act of discumbency, yet the Italian and French translations leave it free, expressing neither sitting or recumbency,—but saith, “*He placed himself at the table:*” and when ours expresseth sitting, it must be understood to have an allusion only to our own general habits. This cir-

cumstance partakes of the nature of the following:—The original text in St. *Luke*, iv. is *πιλεξας το βιβλιον*, translated in the vulgate version *cum plasset librum*, is rendered by ours *he shut or closed the book*, a proper expression for the books of our time, and also for those of the Romans and Greeks; but not so with those of the *Jews*: their books, being written on rolls of skin, as was also the *Samaritan*, could not be said to be so disposed.¹

So also, it is said, the *Samaritan* delivered unto the host two-pence for the provision of the *Levite*; likewise, when in the parable a penny a day is mentioned for the labourer in the vineyard, a correct translation would render that penny $7\frac{1}{2}d.$ per day; it is not to be conceived that our penny, or the 60th part of an ounce, for the word in the original Greek is *δηναριον*, in Latin *denarius*, which the Romans valued at the $\frac{1}{8}$ part of an ounce, which amounts to $7\frac{1}{2}d.$ of our money.

Lastly, although it may be granted the original pass-over was eaten standing, as we have seen, rather than sitting or recumbent, according to the strict and literal meaning of the positive institution; yet, afterwards, as the same ceremony was repeated as a commemorative anniversary,—when a similar necessity did not exist under which those people first laboured, they shaped their conduct to their present existing circumstances. This was so, as just seen; so also was the usual ceremony of taking up the paschal lamb, sprinkling the door-posts with its blood, and several others by their own confession.

In what order Christ and his disciples were disposed, other than with respect to supinity or recumbency, may not be, perhaps, determined; only with respect to Christ himself, and two or three of his disciples; therefore the order of *Cassalius* may be assented unto, who saith, from the *lateran triclinium*, that, being thirteen in number, five lay upon the first bed, five on the last, and three on the middle; of which our Saviour possessed the upper place thereof; it is quite plain *John* lay next and before him, and it is probable *Peter* was the third. That *Judas* was likewise very near is plain, from the circumstance of his dipping in the same dish, and so near, that our Saviour could hand the sop unto him.

Having collected and arranged the best arguments we could meet with, as well as in respect to the mode of feasting, as also with reference to one of the most eventful cir-

¹ Vide the copy of the *Samaritan Pentateuch* in the British Museum, inscribed “*Biblia Sacra.*”

cumstances in the history of Christianity, it now remains that we speak of other matters having relation to entertainments, which will appear in the following order:—times of eating,—several sorts of entertainments,—materials of which those consisted,—with some additional ceremonies observed by the *Grecians*.

Their times of eating consisted of four; 1st. *Ἀυράτισμα*, the *morning meal*; this usually consisted of bread and wine, which they took about the rising of the sun. *Homer* calls this meal *ἄριστον*, which name is probably derived from *ἀπὸ τῆς ἀείρειν*, the first taken away; or rather, perhaps, from *ἀπὸ τῆς ἀριστᾶν*, because his heroes immediately after it went to war.² Sometimes it was called *διανησισμὸς*, *jentaculum*, breakfast.

2d. *Δεῖπνον*, so named, as we are informed by the same scholiast, because after this meal it was usual to return to the war or other labours, whence *τῷ ἀριστῷ συνωνυμεῖ* is often a synonym for the morning meal, as observed by *Athenaeus*³ on this *Homeric* verse:

Οἱ δὲ ἄριστον δεῖπνον ἔλονται, ἀπὸ δὲ αὐτῆς θωρήσσοντο.

3d. *Δειλινὸν*, sometimes termed *ἔσπερισμα*, the afternoon meal; and, 4th. *Δόρπος*, supper, *τὸ παθὲς ἡμᾶς λεγόμενον δεῖπνον*, which latter the *Grecians* termed *δεῖπνον*, according to the before named scholiast,⁴ who will have *δειλινὸν*, or *ἔσπερισμα*, to be a distinct meal from *δόρπος*, and for which he has no better foundation than that verse in *Homer*:

— οὐ δὲ ἔρχονται δειλινός.

Where from misinterpretation the word *δειλινός* was understood of *taking meat*, whereas its import only means a remaining in a certain place in the afternoon. And the sense of this passage *Athenaeus* was so accurately assured of, so certain was that critic that the latter interpretation should be given to it, that he ventures to pronounce those men to be *γελοίσι*, *οἱ φάσιοντες ὅτι τέσσαρας ἐλάμβανον τροφάς*,⁵ ridiculous, who say that the ancient *Greeks* made *four* meals per day.

Others believe the primitive *Grecians* had only *two* meals a day, *i. e.* *ἄριστον* and *δόρπος*, and that the rest are only different names of these. *Athenaeus*⁶ himself affirming that no man can be produced *παρὰ τῷ ποιηῆ τρὶς λαμβάνων τροφάς*, eating thrice a day in *Homer*. Neither is it to be doubted but

² Cicero de Senectute. Potteri vita Sophoclis. Aristophanis Scholiastes ad Ranas.

³ Lib. i. cap. 9.

⁵ Lib. v. cap. 4.

⁴ Iliad, β'.

⁶ Loco citato.

that in those early ages, when the way of living was very frugal and temperate, it was thought sufficient if they had a moderate breakfast, and after the business and labour of the day was ended, refreshed themselves with a plentiful meal; whence *Plato* wondered that the *Sicilians* and *Italians* should eat two plentiful meals every day! and amongst the *Grecians* it was accounted an extravagance to breakfast or dine to the full; neither was it thought convenient by *Cicero*,⁷ *bis in die saturum fieri*, twice a day to eat to the full; and so temperate were the ancient *Romans* that *viles et rusticos cibos ante ipsos focos sumserunt, eosque ipsos capere nisi ad vesperam non licuit*,⁸ they lived upon very mean food, and used not to allow themselves *that* till the evening; whence *Isidorus*,⁹ explaining the words *cœna* and *vesperna*, whereby the supper or evening meal is signified, contradistinguished from the morning, he adds, that *in usu non erant prandia*, dinners were not used.

§. II. *Of different Sorts of Entertainments*.—In primitive times we are assured by *Athenæus*,¹⁰ πᾶσα συμποσία συναγωγὴ τὴν αἵτιαν εἰς θεὸν ἀνέφερε, all meetings at entertainments were occasioned by their devotion to the gods, as has been previously noticed: neither was it usual to indulge themselves with the free use of wines or dainties, εἰ μὴ θεῶν ἔνεκα τετο δρῶνται, unless they did it on a religious account, as the same author affirms;¹¹ for on festival days they rested from their labours, and lived more plentifully than on others, believing, in the words afterwards used by *Ovid*, that their deities were present on such occasions :

—mensæ credere adesse Deos.¹²

And out of this opinion τὰς ἑορτὰς σωφρόνως καὶ ποσμίως δῖηγον, they behaved themselves with sobriety and due decorum at their festival entertainments; neither did they drink to excess, but having moderately refreshed themselves, offered a libation to the gods, and then returned home, as *Athenæus* gives information.¹³

Afterwards, when a more free way of living was in use, we find mention of three sorts of entertainment, i. e. εἰλαπίνη, γάμος, and ἐρανος, which are together enumerated in that verse of *Homer*:

Εἰλαπίνη, ἡ δὲ γάμος ἐπεὶ δὲ ἐρανος τὰ δέ γέ εἰτι.

⁷ *Tusculan.* Quæst. v.

⁹ Originibus.

¹¹ Lib. ii.

¹³ Lib. viii. cap. 16, sub finem.

⁸ *Salvianus*, lib. i.

¹⁰ Lib. v.

¹² *Fastor.* lib. v.

Whence there are commonly said to have been three distinct sorts of entertainments among the ancient *Grecians*; but these may be reduced to two, *εἰλαπίνη* and *ἐρανός*, under one of which *γάμος*, the marriage entertainment, may be comprehended: the first of these (*εἰλαπίνη*) is sometimes termed *εὐωχία* and *ἀσύμβολον δεῖπνον*, and was an entertainment provided at the expense of one man. On the contrary, *ἐρανός* was an entertainment made at the common charge of all present, being so named *ἀπὸ τῆς συνερῆν παὶ συμφέρειν ἕκαστον*, because every man contributed his proportion, as we learn from *Athenaeus*,¹⁴ who likewise says that this entertainment was sometimes termed *θιασος*: hence, the guests were called *συνθιασταί*, who are more commonly named *ἐρανισταί*. What each guest contributed was termed *συμφορά*, *εἰσφορά*, *παλαβολή*, *συμβολή*, &c. whence the entertainment was named *δεῖπνον συμφορητὸν*, *συμβολιμαῖον*, *ἀπὸ συμβολῆς*, *παλαβόλιον*. Sometimes it was called *τὸ ἐκ κοινῆς*, &c. At *Argos*, the contributions were called by a particular name, *χῶν*. The persons who collected the contributions were called by the same name with the guests, *ἐρανισταί*. Hither may be referred *δεῖπνον συναγώγιμον*, mentioned in the Fragments of *Alexis*, which is by *Menander* termed *συναγώγιον*. Both names are derived from *συνάγειν*, which by a peculiar use signified *μετ' ἀλλήλων πίνειν*, to drink together. But whether this entertainment was the same with *ἐρανός*, *Athenaeus* hath professed himself to be uncertain.¹⁵

There were some other entertainments which may be here omitted, because not particularly pertinent to our task; among them, however, was the *ἐρανός*, an entertainment provided at less expense than some others, and more frugal, because the expense of it was sustained by *each of the guests contributive proportions*: such were recommended by the wise men of the time beyond others, on account of their frugality, and from the decorous order generally observed, and thought to be more conducive to friendship and good fellowship among people; whence *Hesiod* left this advice:¹⁶

Μηδὲ πολυξένις δαιτὸς δυσπέμφελος εἴται.
Εκ κοινῆς πλείστη τε χάρις δαπάνη τ' ὀλιγίση.

As at these the guests were more temperate than where the entertainment was provided at the expense of others, so were they also managed with more decency, as remarked by *Eustathius*.¹⁷ The same author has also seasonably remarked on many other *Grecian* customs, which do not apply to our specific purpose.

¹⁴ Lib. viii.

¹⁵ *Sub finem*, lib. viii.

¹⁶ Oper. et Dier. lib. ii. v. 340.

¹⁷ *Commentario in Odyss. a'*, p. 50, edit. Basil.

So different was their behaviour at public contributive feasts, from that at private entertainments, as to furnish the POET with this observation, which he puts in the mouth of *Minerva*, applied to the sailors of *Penelope*: she, the goddess, concluding, from their demeanour, that their entertainment was not ἔρανος, at their common charge, but εἰλαπὶν', or γάμος, and furnished at the expense of a single person:¹⁸

Εἰλαπὶν', ἡὲ γάμος, ἐπεὶ ἐκ ἔρανος τὰ δὶ γ' ἔστι,
 Ωσέ μοι ὑβρίζοντες ὑπερφιάλως δοκέωσι
 Δαίνυσθαι πατὰ δῶμα· νεμεσοσῆσαιτό κεν ἀνὴρ
 Αἰσχεα πολλ' ὄρών, ὅσις πινυτός γε μετέλθοι.

“ But say, you joyful troop so gaily drest,
 “ Is this a bridal or a friendly feast?
 “ Or, from their deeds I rightlier may divine,
 “ Unseemly flown with insolence and wine;
 “ Unwelcome revellers, whose lawless joy
 “ Pains the sage ear, and hurts the sober eye.”

POPE.

Those who were present at such entertainments, without contributing thereto, were termed ἀσύμβολοι, in which condition were poets and singers, with others who made diversion or amusement for the company, whence that saying of *Antiphanes* in *Athenæus*:¹⁹

Ἄκαπνα γὰρ ἀεὶ ἀσύμβολοι θύμεν.

“ We singers always feast without smoke.” POTTER.

For ἀκαπνα θύειν, to feast or kill without smoke, was a proverbial phrase for such as partook of an entertainment without the charge or trouble of providing; whence in *Leonides*'s epigram to *Cæsar*, was this expression:

Καλλιόπης γὰρ ἀκαπνον ἀεὶ θύει.

“ Calliope always kills without smoke.” POTTER.

Intimating, that the Muses and their favourites are always entertained at the expense of others; hence ἀσύμβολος is often taken for a useless person, maintained by other men, who contributes nothing to the general charge. An example of this is found in *Plutarch*, when relating that famous fable of *Menenius Agrippa*, in which the rest of the members are said to accuse the belly ὡς μόνης ἀργύτε καὶ ἀσυμβόλε καθεξομένη, that when they had all some employment, she alone remained idle, and contributed nothing to the common service.

Lastly, it must not be omitted, that in many places there were public entertainments at which a whole city, a tribe, or any particular body of men were present; these were called by the general names συστία, παρδαισια, &c. or some-

¹⁸ Odyss. a', v. 226.

¹⁹ Lib. i. cap. 7.

times taking appellation from the fraternity who met to celebrate them, as *δημοθοινίαι*, *δείπνα δημόσια*, *δημοτικὰ*, *φρατρικὰ*, *φυλετικὰ*, &c. according as those of the same borough (*δῆμος*), fraternity (*φρατρία*), or tribe (*φυλὴ*), met together; and the provision was sometimes furnished by contribution, sometimes by the liberality of some of the richer sort, and sometimes from the public revenue. The *design* of these entertainments is said to have been to accustom men to frugality and economy, and their object to promote peace and good neighbourhood.

In Italy they were first introduced by King *Italus*, from whom that country received its name, as *Aristotle*¹⁸ informs us. The next introduction, in the order of time, was in *Crete* by *Minos*; afterwards *Lycurgus* ushered them among his *Spartans*; whence the origin of *Lacedæmonian public feasts*. The *Cretans* termed theirs *Syssitia*. The *Lacedæmonians* called theirs *φειδίτια*: yet this difference of name was not primitive, if we believe *Aristotle*, who affirms that *τό γε ἀρχαῖον ἐκαλεύνοι Λάνωνες ἢ φειδίτια, ἀλλὰ ἀνδρεῖα, παθάπερ οἱ Κρῆτες*, anciently the *Lacedæmonians* did not use the name of *φειδίτια*, but *ἀνδρεῖα*, which was the *Cretan* word. These entertainments were managed with the utmost frugality, and persons of all ages were admitted; the younger sort being obliged by the legislator to repair hither as to schools of temperance, *διδασκαλεῖα σωφροσύνης*, to learn sobriety; where, by the example and discourse of the elder men, which was generally instructive, they were trained to good manners and useful knowledge. The *Athenians* had likewise their *Syssitia*, as particularly that wherein the senate of five hundred, together with such men who, for the public service or eminent merit, rendered by themselves or ancestors, were thought worthy of this honour; those were entertained at the public expense. There were several other feasts observed by this people, too numerous to mention in this place.

§. III. *Of the Materials whereof these Entertainments consisted.*—In primitive times, men lived upon what fruits the earth produced, and what their rivers and springs afforded. Thus *Lucretius* describes the food they then used:¹⁹

*Quæ sol atque imbre dederant, quod terra crearet
Sponte suā, satis id placebat pectora donum.*

Ælian, describing the most ancient food of many nations, reports, that at *Argos* they fed chiefly on *pears*, at *Athens* on *figs*, in *Arcadia* on *acorns*:²⁰ he adds, that so celebrated were the *Arcadians* for this sort of food, that they are

¹⁸ *De Repub.* lib. vii. cap. 10. ¹⁹ *Lib. v.* ²⁰ *Var. Hist.* lib. iii. cap. 39.

distinguished by *Lycophron*²¹ by the name of βαλανφάγοι, *acorn-eaters*: most other of the Grecian nations used this coarse kind of food; hence the custom cited in the article MARRIAGE, of a boy bringing in *acorns*, and also a basket, a plate with bread, and proclaiming, or singing, Ἐφυγον· κανὸν, &c. and originally done as hath been said, in memory of their leaving their coarse food for bread. Also the *corona civica* was composed *fronde quernâ, quoniam cibus victusque antiquissimus quernus capi solitus sit*,²² of oak leaves; because that tree afforded the most ancient food! for the same reason those which bore *acorns* were termed in Greek, φάγοι from φάγειν, *to eat*; and in Latin *esculi*, from *esca*, which signifies *food*;²³ and as observed by *Macrobius*,²⁴ “ *Meminit vel fabulatur antiquitas glande prius et baccis alitos, sero de sulcis sperâsse alimoniam.*” Ancient authors have either delivered from their own knowledge, or believed and related from tradition, that in the first ages men lived upon acorns and berries, and were long unacquainted with the art of cultivating the land for corn: we have seen that this invention is ascribed to *Osiris* and *Triptolemus*, with the manufacture of bread to *Isis*, although the poets have it, that in the golden age the earth produced corn spontaneously. Thus *Hesiod*—²⁵

ἐσθλὰ δὲ πάντα
Τοῖσιν ἔην· καρπὸν δ' ἐφερε ζείδωρος ἄγνεα
Αὐτομάτη πολλόν τε καὶ ἄφθονον.

“ Fields, yet untill'd, their choicest fruits afford,
“ And fill a sumptuous, and unenvied board.”

But this age having expired, they report the earth became unfruitful, and men falling into extreme ignorance and barbarity, lived, as described by *Macrobius*, *Non multum a ferarum asperitate dissimiles*,²⁶ not unlike brute beasts, and worse, for they were *anthropophagi*,²⁷ or devourers of each other. Some, indeed, have fabulously reported that the art of making bread was originally invented by *Pan*. We must not omit mentioning that it is reported *barley* was used for this purpose before wheat or any other sort of corn, πρώτην γὰρ τροφὴν ταύτην ἀν ἀνθρώποις δεδόσθαι παρὰ θεῶν λόγος ἐχει, it being alleged that this was the first food which the gods imparted to mankind, as observed by *Artemidorus*;²⁸ and that it was *antiquissimum in cibis*, the most ancient sort

²¹ V. 482. ubi conf. commentarii.

²² A. Gellius, lib. v. cap. 6.

²³ *Isidorus*, Orig. lib. xvii. cap. 7.

²⁴ In somnium Scipionis, lib. ii. cap. 10.

²⁵ Oper. lib. i. v. 116.

²⁶ Oper. loco citato.

²⁷ Vide *Diodorus Siculus*, lib. i. part ii. cap. 1.

²⁸ Lib. i. cap. 71.

of ritual, *Atheniensium ritu, Menandro auctore appareat, et gladiatorum cognomine, qui hordearii vocantur*, appears from the custom of the Athenians, mentioned by *Menander*, and from the name of gladiators, who are called *hordearii*, from the Latin name of barley, as related by *Pliny*;²⁸ but in more civil ages, to use the words of the same author,²⁹ *Panem ex hordeo antiquis usitatum vita damnavit quadupedum tradidit refectibus*. “Barley-bread came to be the “ food of beasts only; nevertheless it was still used by the “ poorer sort, who were not able to furnish their tables with “ better provision.” And in the *Roman* camp, as *Vegetius*³⁰ hath informed us, soldiers who had been guilty of any offence, *hordeum pro frumento cogebantur accipere*, “ were “ fed on barley instead of bread-corn:” an example whereof we find in the second *Punic* war, wherein the cohorts who had lost their standard had an allowance of barley assigned by *Marcellus*.³¹ And *Augustus Cæsar*,—*Cohortes, si quæ cessissent loco, decimatas hordeo pavit*, commonly punished the cohorts who gave ground to the enemy, by a decimation, and allowing them no provision but barley, as reported by *Suetonius* in his life of the same emperor.³²

The first ages of men, as *Plato*³³ reports, σαρκῶν ἀπείχοντο, ὡς ἔχοντες τὸν θεῶν βωμὸν αἴματα μιαίνειν, wholly abstained from flesh, out of an opinion that it was unlawful to eat, or pollute the altars of the gods with the blood of living creatures. The same is affirmed by *Dicæarchus* in *Porphyry*, who hath left us a tract concerning abstinence from animals, and by many others. Swine were used for food the first of all animals, they being wholly unserviceable for all other purposes, and having, in the language of *Cicero*,³⁴ *animam pro sale ne putrescant*, “ their souls only, instead of salt, to keep them from putrefying.” As, on the contrary, for several ages after *flesh* came to be eaten, it was thought unlawful to kill oxen, because they were very serviceable to mankind, and partners of his toil in cultivating the ground.³⁵ When animals were first killed, it was usual to kill young ones; whence, as *Athenæus* is of opinion, *Priamus* is introduced by *Homer* reproving his sons for feasting upon young lambs; the reason whereof was, perhaps, that it savoured of cruelty to deprive those of life which had scarce tasted

²⁸ Vide a subsequent article on water, wind-mills, &c.

²⁹ Nat. Hist. lib. xviii. cap. 7. ³⁰ *De Re Militari*, lib. i. cap. 13.

³¹ *Plutarch. Marcellus Livius*, lib. xxvii. ³² Cap. xxiv.

³³ *Lib. vi. de Legibus*. ³⁴ *Lib. ii. de Natura Deorum*.

³⁵ *Archæologia per Archeepiscop. Potter, lib. ii. cap. de Sacrificiis*.

the joys of it, or else because it tended to the destruction of the species.

At a time when sheep were scarce at *Athens*, a law was enacted to *ἀπέκτειναι ἀρνάς γευέσθαι*: forbid the eating of lambs which had not been shorn, as is observed by *Philocronus*.

Neither did the ancients seek for delicacies or rarities, but were content with sheep, swine, goats, and oxen, when it became lawful to kill them; what they caught in hunting; what was most easy to be provided, and at the same time yielded the most nourishment. Hence all the *Grecians*, in *Homer*, live upon simple diet; young and old, kings and private men, were content with the same provisions: *Agamemnon* entertains *Ajax* with a chine of an ox, as the warrior's prize. The same joint is served up by *Achilles*, to those ambassadors sent from the generalissimo of united *Greece*. For those—

“ More dear to *him* than all that bore the Grecian name,”

Were made welcome and refected by—

“ ————— Three chines entire:

“ The brazen vase *Automedon* sustains,

“ Which flesh of porket, sheep, and goat contains.”³⁶

Alcinous, also, the king of *Phæacia*, who affected a more delicate way of living, fed upon beef. *Menelaus*, in the *Odyssey*, sets before *Telemachus* a chine of beef, at the marriage-feast of his son. And the suitors of *Penelope*, though addicted to every sort of pleasure and extravagance, are never entertained with fish, fowl, or any other delicacy. This with many other things hath been observed by *Athenæus*,³⁷ who hath likewise remarked that *Homer's* heroes neither boil their meat or dress it with *sauces*, but only roast it. This was in most places the ancient way of dressing meat; whence *Servius* also reports, that *heroicis temporibus non vescebantur carne elixa*, in the heroic ages they did not eat boiled flesh; and farther observes, out of *Varro*, that among the Romans the primitive diet was roasted, then boiled, and, last of all, broths came into use. Nevertheless, as observed by *Athenæus*, even in the heroic ages, boiled meat was sometimes provided, which appears from that entertainment in the *Odyssey*, where an ox's foot was thrown at *Ulysses*, it being well known that (in the words of that author) *ποδά βόειον ἀδεῖς ὅπται*, no man ever roasts an ox's foot, and likewise from the express words of *Homer*:³⁸

³⁶ Vide Pope's Translation of the *Iliad*, lib. ix. line 273, *et ubi supra*.

³⁷ Lib. i. p. 9.

³⁸ *Iliad* φ', v. 362.

‘Ως δὲ λέβης ζει ἔνδον, ἐπειγόμενος πυρὶ πολλῷ,
Κνίση μελδόμενος ἀπαλοτροφέος σιάλοιο.

“ As when the flames beneath a cauldron rise,
“ To melt the fat of some rich sacrifice.”

POPE.

This was the usual mode of life among the ancient Greeks, and although the *Lacedæmonians* of later ages were less temperate than when the institutions of *Lycurgus* had existence; yet they had their constant diet at the *Συσσίτια*, or *common dining-hall*, where the public were maintained at the general expense of the state, where the food was extremely simple, and each person had a certain proportion allotted him; the chief part of which provision was *μέλας ξωμὸς*, or *black broth*, peculiar to that nation, which was so unpleasant, that a citizen of *Sybaris*, happening to be once entertained at *Sparta*, cried out, “ I no longer wonder why you *Lacedæmonians* are the most valiant soldiers in the world, when any man in his *right wits* would rather die a thousand times than be content to live upon such vile food.”³⁸ It is also reported that *Agesilaus* distributed certain sweet meats among his slaves, saying, “ The servants of virtue ought not to indulge themselves with such delicacies, it being unworthy of men of free birth to share those pleasures whereby slaves are allured.” For this reason the cooks of *Lacedæmon* were only ὄφοποιοὶ πρέως μόνοι, ὁ δὲ παρὰ τῷτο ἐπιστάμενος, ἐξηλαύνετο Σπάρτης, ὡς τὰ τῶν νοσόντων ψαθάρσια, *Dressers of flesh and they who understood any thing farther in the art of cookery were cast out from Sparta, as the filth of men infected with the plague*:³⁹ hence it is said of *Mithæcus*, a very eminent cook, designing to follow his profession in that city, was immediately commanded by the magistrates to depart.⁴⁰ This custom was not unlike that of the ancient heroes, who kept no cooks, but who sometimes dressed their own provisions, as we find *Achilles* in *Homer*:⁴¹

τάμνεν δ' ἄρα δῖος Ἀχιλλεὺς.
Καὶ τὰ μὲν εὖ μίσυλλε, καὶ ἀμφ' ὀβελοῖσιν ἐπειρε.

“ Achilles at the genial feast presides,
“ The parts transfixes and with skill divides.”

POPE.

Sometimes their friends, as we find *Patroclus* officiated as the cook of this prince, as he did on the reception of the Grecian princes on embassy to *Achilles*, before cited. Often the *heralds*, those servants, ἀνδρῶντες θεῶντες, of gods and men, as they are called by the poet, and who performed many of

³⁸ Conf. *Athenæus*, lib. iv. cap. 6, p. 138.

⁴⁰ *Maximus Tyrius*, principio dissert. vii. cap. 22.

³⁹ *Ælianu*s, lib. xiv. cap. 7.

⁴¹ *Iliad*, ix. v. 209.

the holy rites in sacrifices; were likewise occasionally the cooks; whence the ancient cooks are reported by some authors to have been θυτικῆς ἔμπειροι, skilled in the art of divining by sacrifices, and, προΐσαντο γάμων ναὶ θυσιῶν, to have had the management of marriage-feasts and sacrifices.⁴²

But in other *Grecian* cities, as in later periods, the art of cookery was in much greater esteem; though even *Heraclides* and *Glaucus* the *Locrense*, who wrote books concerning it, affirm ὡς ἀρμόττειν τοῖς τυχῆσιν ἐλευθέρων, “that it was unworthy of the meanest person who was free born,” as we are informed by *Athenaeus*.⁴³ The *Sicilian* cooks were prized above all others, as the same author has proved⁴⁴ by examples out of *Cratinus* and *Antiphanes*. The before-named *Mithæcus* was of that nation: and so remarkable were the *Sicilians* for luxurious living, that Σικελικὴ τράπεζα, a *Sicilian table* was a proverbial phrase, as *Suidas* asserts, ἐπὶ τῷ πάντα πολυτελῶν ναὶ τρυφηλῶν, for one furnished very profusely and luxuriously. Next to the *Lacedæmonian* tables, those of *Athens* are said to have been furnished most frugally; the *Athenian* soil, being unfruitful, could supply no more provision than was just necessary for the support of its inhabitants: hence, *Lynceus* the *Samian*, is cited by *Athenaeus*⁴⁵ for contemning the *Athenian* entertainments:

Μάγειρ, ὁ θύων ὁ δειπνίζων τὸ ἐμὲ,
‘Ρόδιος’ ἔγώ δ’ ὁ κεκλημένος, Περίνθιος·
Οὐδέτερος ἡμῶν ἥδεται τοῖς Αττικοῖς
Δείπνοις· ἀνδία γάρ ἐσιν Αττική.

The same author goes on in his description of the meanness of *Athenian* entertainments, and generally of its provisions, which were so exceedingly parsimonious, that *Dromæas*, an *Athenian* parasite, being asked whether the suppers at *Athens* or those at *Chalcis* were most magnificent, replied, that the προοίμιον first course, at *Chalcis*, was preferable to a whole *Athenian* entertainment: hence to live Αττικῆς, like an *Athenian*, is to live penitiously; an example of which proverb is to be found cited by *Athenaeus* out of *Alexis*, who has also there left a large description of an *Athenian* entertainment.⁴⁶

Having now spoken of *Grecian* meats, of the chief of *Grecian* food, there now remains only to notice that occasionally entertainments consisted of newly-pressed honey

⁴² *Athenæus*, lib. xiv. cap. 22.

⁴³ Lib. xiv. cap. 23.

⁴⁴ Loco citato.

⁴⁵ Lib. iv. cap. 3.

⁴⁶ Lib. iv. cap. 5.

mixed with flour. Thus, we find in *Homer*, at the time *Nestor* brought *Machaon* wounded from the field, that the entertainment on that occasion consisted of

“ Honey new press’d, the sacred flour of wheat,
“ And wholesome garlick crown’d the savory treat.”⁴⁶

We have now to speak of their drink. Upon this last occasion a wine was used they called *Pramnian*: although we understand that water was the general beverage, and what the nearest spring supplied. In after times hot fountains came in great request, and from the example of *Hercules*, who being much fatigued with excessive labour, found himself refreshed by a spring of this sort, discovered to him by *Minerva* or *Vulcan*; whence this sort of water was thought extremely beneficial upon all similar occasions; and whence, also, *Plato* finds an opportunity to praise his *Atlantic* island, because it yielded hot as well as cold springs. *Homer*, whose verses often furnish historians with materials for enlarging, and also occasionally for correcting their ideas, tells us, that in *Phrygia*, one of *Scamander*’s fountains was a *hot* and the other a *cold* spring. But they seem only to have been used for bathing, unless prescribed by physicians, as was usually done to old people, to assist the digestive powers. However, it really appears that in later ages hot waters were in great request among the *Romans* as well as the *Greeks*. Thus *Plautus*,⁴⁷ speaking of the *Grecians*:

Ubi quid surripuere, operto capitulo caldum bibunt.

And *Horace* also

*Quo Chium pretio cadum
Mercemur? quis aquam temperet ignibus?*

Acron thus explains the Roman poet last cited in the word *temperet*, by *tepefaciat*, *nam tepefactis aquis solebant Græci vinum temperare*. For the *Greeks*, saith he, used to temper their wine with *warm* water.⁴⁸ And consistent with this remark is the advice of *Nestor* in the 10th *Iliad*:

“ With *Thracian* wines recruit thy honoured guests,
“ For happy counsels flow from sober feasts.” POPE.

The early *Greeks* seldom indulged to excess in either eating or drinking; took no more than nature required of either, which temperate moderation is thus with allusion advised by *Ulysses* in the 19th *Iliad*:

⁴⁶ Pope’s Translation of *Iliad*, b. xi. 771. *ubi supra.*

⁴⁷ *Curculione.*

⁴⁸ *Conf. Athenæus*, lib. ii. cap. 2.

“ Strength is derived from spirits and from blood,
 “ And these augment by generous wine and food.
 “ What boastful son of war without that stay
 “ Can last a hero through a single day?”

POPE.

Cold water is mentioned, however, more frequently than hot, for the purpose of increasing this quality. The ancients had a method to preserve *ice* through the heat of summer; one, mentioned by *Plutarch*, relates that it was usually preserved in straw or clothes: to which custom *St. Austin* is presumed to allude in these words: *Quis dedit paleæ tam frigidam vim, ut obrutas nives servet; vel tam servidam, ut poma immatura matureret?* “ Who has endued the straw with such a degree of cold as to preserve ice; or with so much heat as to bring unripe fruit to maturity?” In Rome there were certain shops in which ice was exposed to sale, which *Seneca* inveighs against as a great luxury. *Unguentarios Lacedæmonii expulere, et propere cedere finibus suis jusserunt, quia oleum disperderent: quid illi si vidissent nivis reponendæ officinas?* “ The *Lacedæmonians* banished the sellers of ointment, and commanded them to begone with the utmost speed out of their country; what would they have done, had they seen shops in which to reposite and preserve ice?”

The invention of wine was by the *Hebrews* ascribed to *Noah*, by the *Egyptians* to *Osiris*, by the *Romans* to *Saturn*, the oldest deity in all countries, and conceived to have been the said *Noah*, and by the *Greeks* to *Bacchus*; to observe that these persons so named by the *Hebrews*, *Egyptians*, and *Greeks*, were one and the same individual, would be superfluous;—a fact established, and so well known, needs no proof in confirmation.

The historian of *Greece*⁴⁸ adds to this portion of his subject, that the vine was said to have been first discovered in *Ætolia*, by *Oresteus*, son of *Deucalion*, (here again we recognise *Noah*,) whose grandson *Oeneus*, from whom that part of *Greece* received its name, was so called from *οῖνος*, the name of wine, from this *Oeneus*, who, as it is reported in *Greece*, first discovered the art of pressing wine from grapes. Thus *Nicander*:

Οἰνεὺς δ' ἐν κυιλοισιν ἀποθλίψας δηπάειν
Οἶνον ἔκλησε.

And expressly to the same purpose is that verse of *Melanippides*, the *Milesian*, in *Athenæus*:

Ἐπώνομος, ὡ δέσποτ', οἶνος Οἰνέως.

Whilst some will have the vine to be discovered in

Olympia, near the river *Alpheus*: of which opinion was *Theopompus* of *Chios*. And *Hellenicus* reports it was first known at *Plinthion*, a town of Egypt; and, he says, whence the Egyptians are thought to have derived their immoderate love of this liquor, they thinking it necessary for the preservation of the human body: he likewise mentions the Egyptian invention of *Zythen*, which we have noticed from *Diodorus Siculus* in another place; but, instead of the motive which Diodorus ascribes to the *Egyptian* prince, of, “where ‘‘ vines would not grow,” the author we now consult says, this wine from barley was invented for the use of those who could not afford to purchase that expressed from grapes.⁵⁰

It was also customary in Greece for the matrons and virgins to drink wine, as appears from the example of *Nausicaë* and her companions in the *Odyssey*; and because the same freedom was not allowed the sex in other countries, the Grecian women were ill-thought of on that account.⁵¹ It was likewise usual to give it to children, unless the management of *Achilles* was different from that of other children. Thus *Homer* has introduced *Phœnix* speaking to him:⁵²

Πρίν γ' ὅτε δὴ σ' ἐπ' ἐμοῖσιν ἐγὼ γένασσοι καθίσσας,
Οὐφε τὸ ἄσαιμι προταμῶν, καὶ οἴνον ἐπιτίχων.
Πολλάκι μοι κατέδευσας ἐπὶ σῆθεσσι χιτῶνα
Οἴνος, ἀποβλύζων ἐν νηπιένη ἀλεγειγῆ.

“ Nor wouldest thou taste thy food at home, till first
“ I placed thee on my knees, with my own hand
“ Thy viands carv'd and fed thee, and the wine
“ Held to thy lips; and many a time in fits
“ Of infant frowardness, the purple juice
“ Rejecting, thou hast deluged all my vest
“ And filled my bosom.”

COWPER.

The wine was generally mixed with water; whence drinking-cups were called *κρατῆρες*, *παρὰ τὸ κεράσαδαι*, from the mixture made in them; which derivation is mentioned both by the grammarians and *Athenæus*, and there are some allusions to it in *Homer*; of the custom of drinking wine tempered with water observed in the time of the Trojan war, and the most primitive ages; hence the following verse:⁵³

Οἱ μὲν ἀροῦνον ἐνὶ κρητῆρσι καὶ ὕδωρ.

Some ascribe the first use of it to *Melampus*;⁵⁴ others to *Staphylus*, the son of *Sileneus*. *Philocorus* is said to re-

⁵⁰ Conf. *Athenæus*, sub finem, lib. i.

⁵¹ *Odyss.* vi. vide also *De Pau* and *Dr. Rees's Cyclopæd.* article *Athenian*.

⁵² Conf. *Athenæus*, lib. x.

⁵³ *Iliad* ix. 488.

⁵⁴ *Odyss.* a'.

⁵⁵ *Athenæus*, lib. vi. cap. 2.

port⁵⁶ that *Amphictyon*, king of *Athens*, learned to mix wine with water from *Bacchus* himself, on which account he erected an altar to that god, under the name of *Oρθίος*, because from that time men began to return from entertainments sober and ὁρθοὶ, *upright*. The same king enacted a law, that wine tempered with water should be drank at entertainments, which being afterwards disused, was revived by *Solon*.⁵⁷ There was no certain proportion observed in this mixture; some to one vessel of wine poured in two of water; others to two of wine mixed five of water; and others more or less, as they pleased.⁵⁸ The *Lacedæmonians* εἰς τὸ πῦρ ἐῶσι τὸν οἶνον, ἔως ἂν τὸ πέμπτον μέρος ἀφεχθῇ, καὶ μετὰ τέσσαρα ἔτη χεῶνται, used to boil their wine over a fire, till the fifth part was evaporated, and then, after four years were expired, began to drink it,⁵⁹ as *Democritus* says; and the same custom is alleged by *Palladius*. Nevertheless, most of the *Grecians*, and particularly the *Lacedæmonians*, did ἀκρατέσερον πίνειν, drink wine with little or no water, which they termed ἐπισκυδίσαι, to act like a *Scythian*; for the *Scythians* were very much addicted to drunkenness, and used wine without water; whence ἀκρατοπιεῖν is commonly termed σκυδίσι πίεῖν, or σκυδοπιεῖν, and ἀκρατοποσία is likewise called σκυδικὴ πόσις: which expressions came into vogue in *Sparta*, from the time that *Cleomenes*, the *Spartan*, by living and conversing with the *Scythians*, learned to drink to excess and even madness.⁶⁰ The *Thracians* also drank their wine unmixed with water; and both they and the *Scythians* were such lovers of it, that γυναικές τε καὶ πάντες αὐτοὶ κατὰ τῶν ἱματίων (ἀκρατον) καταχεόμενοι, καλὸν καὶ εὐδαιμονέπιτήδεν μα ἐπιτηδεύειν νεομίνασι, * “the women and all the men thought it a most happy life to fill themselves with unmixed wine, and to pour it upon their garments.”⁶¹ Hence, also, by Θρακίην πρόποσις, ‘the *Thracians* way of drinking,’ was meant ἀκρατοποσία drinking wine not mixed with water.⁶²

Some used to perfume their wines, which was termed οἶνος μυρρινίτης, according to *Aelian*;⁶³ and sometimes μυρρίνης, for that word, according to *Hesychius*’s explication, signifies πόσιν, ἡ ἐπεχεῖτο μύρον, a potion mixed with odours. Different from this was the *murrhina* of the *Romans*, as also the ἐσμυρνισμένος οἶνος, wine mingled with myrrh, mentioned in *St. Mark’s gospel*, wherewith the malefactors were com-

⁵⁶ *Plin.* lib. vii. cap. 56.

⁵⁸ *Idem*, lib. x. cap. 8.

⁵⁹ *Idem*, lib. x. cap. 7.

⁶⁰ *Chamæleon Heracleota*, lib. de Temulentia apud *Athenæum*, lib. x. cap. 9.

⁶¹ *Athenæus*, lib. x. sub finem, cap. 9.

⁶³ *Var. Hist.* lib. xiii. cap. 31.

⁵⁷ *Athenæus*, lib. ii. cap. 2.

⁶² *Pollux*, lib. vi. cap. 3.

monly intoxicated before they suffered.⁶² Several other ingredients were mixed with wine; sometimes meal, which was very much used by the Persians.⁶⁴ They had many sorts of wines, as *οἶνος κριθίνος*, *cerevisia*, wine made of *barley*; *οἶνος ἐψητὸς*, palm wine, sometimes termed *όξος ἐψητὸς*, for *όξος* was a general name for all made wines.

Ceremonials observed before, at, and after Entertainments.

—For the person who gave the entertainment, the parties invited, and those by whom the invitations were delivered, the Greeks had several appropriate names. They were likewise very particular in naming upon the card of invitation the exact time when the entertainment was to take place: the ancient Greeks reckoned time by the shade of the sun; their dials were distinguished into distinct periods by letters, whence *σκιὰ*, *shade*, and *σοιχεῖον*, the letter of the dial, frequently appear upon these occasions. *Aristophanes*⁶⁴ notices it in these verses:

— σοὶ δὲ μελῆσει,
‘Οταν ἡ δεκάπτυν σοιχεῖον λιπαρῶς χωρεῖν ἐπὶ δεῖπνον.

The number of guests seldom exceeded four or five; independent of whom, certain favourites of princes and other dependents of great men usually accompanied their patrons, and were generally denominated *σκιαὶ*,⁶⁵ *shades*, from their closely following their patrons as shades do bodies: the Romans called them *umbræ*, whence *Horace*,⁶⁶

— *quos Mæcenas adduxerat umbras.*

In another place the same poet says,⁶⁷

— *locus est et pluribus umbris.*

Those who usually intruded themselves into other men's entertainments the Greeks called *μυῖαι*, and the Latins named *muscae*, flies, a general term of reproach for unwelcome persons among both people.

It was also customary for relations of the party making a feast to go to it unasked, as we learn from Homer:⁶⁸

Αὐτόματος δε οἱ ἥλιθε βοὴν ἀγαθὸς Μενέλαος.

“ And Menelaus came unbid the last.”

POPE.

⁶² The criminal laws of this kingdom also permitted this practice, which was at one time universal, but the place where it was last used was at York;—whence the anecdote of the saddler of Bawtree, who was hung for leaving his *ale* behind him: because, had he stopped to have taken it, a reprieve would have saved his life.

⁶³ *Athenæus*, lib. x. initio, cap. 9.

⁶⁴ *Concionatricibus*, p. 744. Conf. ibi scholiastes, item *Suidas*, v. *Δεκάπτυν σκιὰ*, et *Hesychius*, v. *δεκάπτυν σοιχεῖον*.

⁶⁵ *Plutarchus Sympos*, lib. vii. quæst. 6.

⁶⁶ Lib. ii. Sat. viii. v. 22.

⁶⁷ Lib. i. Epist. v. 28.

⁶⁸ *Iliad*, β', v. 403.

Also persons of credit usually visited each other on days of entertainment without any formal invitation, as Eustathius informs us :⁶⁹

Ακλήτοις παραίτεσσιν εἰς φίλας φίλοι.

The number of guests was sometimes unlimited. Homer, indeed, speaks of dining by *δεκάδες*, or tens, in the person of *Agamemnon*.⁷⁰

‘Ημεῖς δέ εἰς δεκάδας διακοσμηθεῖμεν Αγαμεμνόνι,
Τρεών δέ ἄνρραι ἔκαστον ἐλοίμεθα οἰνοχνεύειν,
Πολλαίς πεντε δεκάδες δευοίατο οἰνοχάριο.

“ So small their numbers, that if wars were ceas'd,
“ And Greece triumphant held a general feast,
“ All rank'd by tens, whole *decades* when they dine,
“ Must want a Trojan slave to pour the wine.”

POPE.

It also appears from the history of Grecian transactions, that men and women were never invited together.⁷¹ Cornelius Nepos assures us, that the customs of the Greeks and Romans were essentially different in this respect.

“ For which of the *Romans* was ever ashamed to bring his wife to an entertainment? And what mistress of a family can be shown, who does not inhabit the chief and most frequented part of the house? Whereas, in *Greece*, she never appears at any entertainments, but constantly resides in the innermost part of the house, which is called *γυναικάντις*, the women's apartment, into which no man, except relations, has admission.”⁷²

Before they went to an entertainment it was customary to wash and anoint themselves, *ἀπεπτέσις γὰρ ἦν ἡκειν εἰς τὸ συμπόσιον σὺν ιδρῶτι πολλῷ καὶ πονηρτῷ*, for it was thought very indecent to go thither defiled with sweat and dust, as *Athenaeus* hath observed from *Aristotle*. They who came off a journey were washed, and clothed with apparel suitable to the occasion, in the house of the entertainer, before they were admitted to the feast. This is found in the *Odysssey*, where the poet describes the reception of *Telemachus* and *Pisistratus* by *Menelaus*:⁷³

Ἐς δέ ἀσταμάνθες βάντες ἐϋξέσας λέσσαντο·
Τὸς δέ ἐπεὶ ἐν δωμαὶ λύρσαν, καὶ χρῖσαν ἐλαίῳ,
Αμφὶ δέ ἄρα χλαίνας ὄλας βάλον ἥδε χιτῶνας,
Ἐς δέ θρόνος ἔζοντο πάρ' Ατρείδην Μενέλαον.

⁶⁹ Commentario in *Iliad*, 6'.

⁷⁰ *Iliad* 8', v. 126. Conf. Eustathius, p. 144. edit. Basil.

⁷¹ *Cicero* *Orat.* iii. in *Verrem*.

⁷² Cornelius Nepos *præfat.* in *vitæ imperatorum*.

⁷³ *Odyss.* 8'. v. 48.

“ From room to room their eager view they bend ;
 “ Thence to the bath, a beauteous pile descend ;
 “ Where a bright damsel-train attend the guests
 “ With liquid odours, and embroider'd vests.
 “ Refresh'd, they wait them to the bower of state,
 “ Where circled with his peers Atrides sate.”

POPE.

The same persons also washed their hands before they sat down to meat, as appears from the following verses :

Χέρνισα δ' ἀμφίπολος προχώῳ ἐπέχενε φέργσα
 Καλὴ χρυσείη, ὑπὲρ ἀργυρέοιο λέβητος,
 Νίψασθαι· παρὰ δὲ ξεσὴν ἐτάνυσσε τράπεζαν·
 Σῖτον δ' ἀιδοῖη ταμίη παρέθηκε φέργσα.⁷⁴

“ Thron'd next the king, a fair attendant brings
 “ The purest product of the chrystral springs ;
 “ High on a massy vase of silver mould,
 “ The burnish'd laver flames with solid gold.”

POPE.

We should have observed, that a law existed in Athens, which limited the number of guests ; no person being allowed to entertain above *thirty* at once. In order to put this statute in execution, the cooks who were employed to dress the victuals were obliged to give in their names every time they were hired.⁷⁵

We should also have noticed, that those dependents who were termed the shades of great men, and the flies at entertainments, were also denominated *παρασίτοι*, *parasites*. *Lucian* hath observed, this word in its primitive sense properly denoted the companions of princes and men of the first quality, as *Patroclus* to *Achilles*, *Memnon* to *Idomeneus*, &c. ; however, afterwards it became a term of reproach, and was applied to those, who, by flattery and other mean arts insinuated themselves to the tables or favour of other people.

It was usual to wash between every course, and after supper ; thus *Homer* introduces his heroes δειπνῆντας, διμιλῶντας, εῖτα ἀπονιψαμένος ποιεῖ τάλιν δειπνῆντας, *supping, conversing, then washing*, and after that *supping again* ; and *Aristophanes*⁷³ speaks of bringing ὕδωρ πατὰ χεῖρος μετὰ τραπέζας, *water to wash the hands after the courses*. By those who spoke accurately, to wash the hands before supper was termed νίψασθαι, to wash after supper ἀπονιψασθαι. Hither are to be referred the words, ἀπομάξασθαι, ἐναπομάξασθαι, ἀποψῆσαι, and the like, which signify to wipe the hands ; the towel was termed ἐκμαγεῖον, χειρόμαντρον, &c. instead whereof, the ancient Greeks used ἀπομαγδαλίαι which were τὸ ἐν τῷ ἀρτῷ μαλακὸν καὶ σατιρῶδες, *the soft and fine part of bread*, which after-

74 Odys. δ'. v. 62, *ubi supra*.

73 Vespis.

75 Conf. *Athenaeus*, lib. vi. cap. 11.

wards they cast *τοῖς κυσί*, *to the dogs*, ὅτε καὶ Λακεδαιμόνιοι πύραυλοι ἀπομαγδαλίαν καλέσον, whence ἀπομαγδαλία is by the Lacedæmonians called κυνάς; and as the same author there adds, this custom is mentioned by *Homer* in the following verses :

Ὥς δὲ ὅταν ἄμφι ἀνακτα κύνες δαίτηθεν ιόντα
Σαίνωσ', αἰεὶ γάρ τε φέρει μετλίγματα θυμῷ.

It should be observed, that after supper they scented the hands with *σμῆγμα ἀπορύχεως χάριν*, compounds of the nature of *hyssop* and *nitre*. The article *hyssop* is frequently mentioned in the holy scriptures, it is conjectured for similar purposes.⁷⁴ After thus washing, the hands were perfumed with odours, which custom is mentioned in those verses of *Antiphanis*, or *Ephigenes*, in *Athenæus*:⁷⁵

Καὶ τότε περιπατήσεις καπονίψει κατὰ τρόπον
Τὰς χεῖξας, εὐώδη λαβὼν τὴν γῆν θ' ἄμα.

The custom of washing and anointing in *Greece*, and other hot countries, is very frequent, as it serves to preserve the body from filth, and at the same time greatly refreshes it; whenever they ceased from sorrow, it was usual to bathe and anoint; whence *Eury nome*, in *Homer*, advises *Penelope* to leave of lamenting:⁷⁶

Χεῖτ' ἀπονιψαμένη καὶ ἐπιχρίσασα παρειάς.

“ To wash her body, and anoint her face.”

And as Artemidorus tells us,⁷⁷ the Greeks commonly bathed after the conclusion of a war, or other great fatigue. Thus, in *Homer*, *Telemachus* and *Pisistratus* are bathed after a journey, at the court of *Menelaus*; *Diomedes* and *Ulysses*, after their return from discovery of the Trojan camp, and the death of *Rhesus*, and the capture of his horses; and to mention no more, in the performance of this rite, it is probable *Agamemnon* was assassinated by *Ægisthus*. In the heroic ages, men and women, without distinction, bathed themselves in rivers; thus we find *Nausicaë*, the daughter of *Alcinous*, king of *Phæacia*, in the *Odyssey*, and *Europa*, in *Mochus*,

————φαιδρέννοιτο χρόα προχοῖσιν Αναύρα,
“ ————— cleanseth her body in the river *Anaurus*. ”

⁷⁴ “ Purge me with hyssop,” says David, “ and I shall be whiter than snow.”

⁷⁵ *Athenæus*, lib. x. cap. ult.

⁷⁶ *Odyss. σ',* v. 170. See also the admonition of the Saviour to the *Pharisees*; the customs of both *Greeks* and *Hebrews* were very nearly similar.

⁷⁷ Lib. i. cap. 66.

Helena also, and her fellows wash in the river *Eurotas*, according to *Theocritus*.⁷⁷

Although it has been suggested that it is probable the passage alluded to in this last-named poet was meant to be accommodated to the institutions of *Lycurgus*, whereby the virgins were obliged to bathe and accustom themselves to other exercises, to improve their health and strength, similar to those practised by the other sex. If the sea was within a convenient distance, it was preferred to rivers, being thought to strengthen the nerves, and dry all superfluous humours of the body. When the parties desirous of bathing lived far from the sea, they went and resided occasionally on its coasts. The Phœacians are said, in *Homer's Odyssey*, to place their chief delight in

Ἐξματά τ' ἐξημοιβά, λοετρά τε θερμά, καὶ εύναι,

“ Changes of apparel, hot baths, and beds.” POTTER.

Yet hot baths in those ages do not appear so frequent as in latter times. For want of the sea or rivers, the ancients kept in their houses certain large earthen vessels of *Samian* production, called *αμφορα*, *Amphora*; remains of those used by the *Romans*, in this country, are constantly discovered in Roman stations. Our tessellated and Mosaic pavements were also the flooring to their baths. They had also *lavatrinia*, or *latrina*; and when the practice was introduced to use a hot as well as cold bath, these they termed *balnea*. Public *balnea* were unknown till later times.

After bathing they always anointed, to close the pores of the body, which was peculiarly necessary after hot baths, and also to smooth the skin. *Pliny* informs us, that in early times they had no other ointment than *oil*, afterwards they impregnated this with some perfumes, generally roses; with this *Venus*, it is presumed, anointed the body of *Hector*: in the 23d *Iliad*.

— ῥοδόεντος δὲ χρῖεν ἐλαῖω
Αμβροσίω.

The same ointment has in other places the pronomene *ἀμβρόσιον* ἐδανον, and *τεθυαμένον*,⁷⁸ speaking of Juno:

Ἄμβροσίη μὲν πρῶτον ἀπὸ χροὸς ἴμερόεντος
Λύματα πάντα κάθηρεν, ἀλείψατο δὲ λίπ' ἐλαῖω,
Ἄμβροσίω, ἐδανῷ, τό γά οἱ τεθυαμένον ἦεν.

Athenæus was of opinion that *Homer* was acquainted with more precious ointments, which he denominates by the sim-

ple name of oil, with the additions of some epithet to distinguish them from common oil.⁷⁹ The same obversation is made by other commentators on the same poet, when they explain the words *αὐώδες ἔλαιον*, perfumed oil. It is well known the *Jews* called all unguents oils; the reason appears to be, that it was so named because oil is the basis of the composition; thereby it agrees with the simple brevity of the ancient expression, and particularly with that which distinguished the Hebrew language.

Socrates was of opinion that the smell as well as the garments of men and women should be different. That for women, it was decent enough to smell of *perfumed ointments*; but that men should rather smell of *oil*. The laws of Sparta expressly forbad any one to sell them, as *Athenæus*⁸⁰ informs us; nevertheless, women and some effeminate men were critically choice in their selection of ointments, ποτὸν τι ἐκάρτω τῶν μελῶν ἐσιν ἐπιτήδειον, that suited best with each member of the body; an example whereof is found in the following verses of *Antiphanes*, cited by *Athenæus*:

Ἐκ χρυσοκολλήτω δὲ κάλπιδος μύρω
Αἰγυπτίω μὲν τὰς πόδας καὶ τὰ σκέλη,
Φοινικίνω δὲ τὰς γνάθους καὶ τὰ τιτθέα,
Σισυμβρίνω δὲ τὸν ἔτερον βραχίονα,
Αμαρακίνω δὲ τὰς ὄφρους καὶ τὴν κόμην,
Ἐρπυλλίνω δὲ τὸ γόνυ καὶ τὸν αὐχένα.

We shall observe in the last place, that the feet, from being most exposed to dirt, dust, and filth, needed more washing, and required oftener to be anointed, than any other member of the body; accordingly, they had this attention paid to them: whence some have thought they have been denominated by *Homer*, *λιπαροὶ πόδες*.

Women, we find, were generally employed in this service, as well in the heroic as the latter ages. It was also customary to kiss the feet of those to whom more than common respect was due; thus the woman in the gospel kisses the feet of our Lord whilst she anointed them. The same ceremony was performed towards *Philolean*, by his daughter, as himself relates in *Aristophanes*:⁸¹

καὶ πρῶτα μὲν θυγάτηρ με
Απονίζῃ καὶ τὰ πόδα ἀλείφῃ καὶ προσκύψασα φιλήσῃ.

The first ceremony after the guests had arrived at the

⁷⁹ Lib. xv. cap. 11.

⁸⁰ Lib. xv. cap. 10.

⁸¹ Vespis, p. 473.

house of the entertainer, was the salutation performed by the master of the house, or one appointed in his place; to do this, was termed by the general appellative of *ἀσπάζεσθαι*: this word, in its strictest sense, signifies to embrace one with arms around, derived from forcibly drawing another to one's self. But the most general form of salutation was presenting the *right hand*, that being considered a pledge of fidelity and friendship; whence *Pythagoras* advises that the *right hand* should not be given to *every one*, meaning that all persons were unworthy of our esteem. This ceremony is as ancient as the *Homeric* age.⁸²

Sometimes they kissed the lips, hands, knees, or feet, in salutation, as the person was deserving of more or less respect. Sometimes, and especially towards children, they took the person like a *pot* by both his ears, as mentioned by the poets of Greece⁸³ and Rome.⁸⁴ From a review of *Theocritus*, it appears this was common to both sexes.⁸⁵

After the guests had been admitted, they did not sit down immediately to the table, which would have been regarded as ill-breeding, but spent some time in viewing and commanding the rooms and furniture, criticising, and generally praising the taste of the possessor. These things a son, in *Aristophanes*,⁸⁶ instructs his father to do. A great number of observations on these points will be discovered in *Athenaeus*.

Customs at Entertainments.—It has ever been the fate of the human species to appreciate those things which fortune or fate has deprived them of the power of enjoying; whether they had the means to ascertain its value, before they are sensible of the loss, special circumstances must determine: but, speaking of man, we have been ever in the habit of paying a high veneration to ages of *heroism* and *virtue*; this feeling we have been taught derives its existence from commendable affections of the human heart. It was exactly the case with the latter Greeks, that they admired the manners of their ancient and heroic progenitors, even in their smallest *minutiæ*, for it is discovered they emulated their virtuous ancestors, even in their modes of reposing to take their repasts. The ancient Greeks had three receptacles of this description; 1st, *Δίφρος*, which as its name imports contained two persons only, and was usually for those of the lowest quality invited: 2d, *Θρόνος*, on which they sat upright, having under their

⁸² Eurideus.

⁸⁴ Tibullus.

⁸³ In Antia, apud Julium Pollucem.
⁸⁵ Idyll, ε', v. 132. ⁸⁶ Vespis.

feet a footstool, termed Θρῖννος; 3d, Κλισμὸς, on which they sat leaning a little backwards, as the word signifies. Of these the attentively industrious *Athenæus* renders an account.

It appears that in the primitive ages, it was usual for people to sit at their meals as well in Greece as in other countries, as the historian of Greece says; but in latter times this was not adhered unto, for the *Persians* having obtained possession of *Sardis*, with the territories of *Cræsus*, being proximate to Greece, Asiatic luxury was introduced; when those yet virtuous, frugal, and simple manners, which had hitherto distinguished the Grecian people were relinquished, and they adopted oriental modes and foreign customs, among which that of *discumbency at meals* also came to be introduced, and by degrees became general.

In *Macedonia* it was customary for no man to sit at meals until he had slain a boar without nets, as *Hegesander* informs us in *Athenæus*.⁸⁷ We learn from *Duris*, in the same author, that *Alexander the Great* sometimes kept to the ancient way, and once τετρακοσίας ἡγεμόνας ἐτιῶν ἐκάθισεν ἐπὶ διφερων ἀργυρῶν καὶ πλινθῆσαν, ἀλεγροῖς περιστρῶσας ἵματίοις, entertaining 400 commanders, he placed them upon silver seats covered with purple cloth.

In the most luxurious and effeminate ages, children were not permitted to lie down, but had seats at the end of their father's beds. It was the custom for the children of the princes and the rest of the nobility of that age, to *sit* at their meals in the sight of their relations, in the time of *Tacitus*.⁸⁸ Whence *Suetonius*, describing the behaviour of *Augustus* towards his grandchildren, says, *neque cœnavit una, nisi in imo lecto adsiderent*, they always sat at the end of the bed when they supped with him;⁸⁹ and the same author reports that the Emperor *Claudius* always supped with his children, and some of the noble boys and maids, who according to ancient custom sat at the bottom of the bed.⁹⁰ The same place was commonly assigned to men of meaner condition, when they were entertained with those of better quality. Whence, in *Plutarch*, the rest of the guests lie down, only *Æsop* is placed upon a seat next to *Solon*. And *Donatus* reports, that *Terence* being ordered to repeat some part of his comedies to *Cæcilius*, went to him at the time of supper, and, being in mean apparel, was placed upon a seat near the bed; but, after he had recited a few verses, was invited to lie down to supper.

⁸⁷ Lib. i. cap. 14.

⁸⁹ Augusti, cap. 64.

⁸⁸ Annal. lib. xiii.

⁹⁰ Claudi, cap. 32.

At the beginning of the entertainment, it was customary to lie flat upon their bellies, that so their right hand might with more ease reach the table; this position will account for the expression, which may have been thought ænigmatical, of *Mary Magdalene standing behind Jesus, whilst he was at supper, and at the same time washing and anointing his feet.* When their appetites began to decrease they changed their position, reclining upon the left elbow: in which sense *Plutarch* is to be understood, when he says, ἔκαστον ἐν ἀρχῇ μὲν ἐπὶ σόμα προνεύειν, ἀποθλέποντα πρὸς τὴν τράπεζαν ὕσερον δὲ μητασχηματίζειν ἐπὶ βάθος πλάτες τὴν κατάκλισιν, or, as it should be read, κατάκλισιν, that at the beginning every one put his mouth forward, looking towards the table; but afterwards changes the posture of his inclination from depth to breadth. And *Horace*, in the following verses,⁹¹ evidently alludes to the same custom:

*Nec satis est cara pisces avertere mensa,
Ignarum quibus est jus aptius, et quibus assis,
Languidus in cubitum sese conviva reponet.*

It was customary, from the heroical ages downwards, for the guests to be ranked according to their quality. It is evident that in *Homer*, as *Eustathius*⁹² hath observed, ἐν συμποσίοις ἄκροι κάθηνται οἱ ἀριστεῖς, “the chief persons had “the uppermost seats at entertainments.” And afterwards, at public entertainments, there was ὄνομακλήτωρ, *nomenclator*, a person appointed to call every guest by name to his proper place.

The order in which they sat, and which were accounted the chief places, have been already spoken of, and illustrated as far, perhaps, as modern ideas are sanctioned upon customs so remote. However, it appears from some expressions in *Homer*, that the heroes sat in ranks, the chief persons being placed at the head of each rank, on both sides of the table, which is the meaning of the word ἄκροι, *uppermost*, in the before cited passage from *Eustathius*.

In the ninth *Iliad*, where *Achilles* entertains the ambassadors of *Agamemnon*, he places himself the uppermost in one rank, and *Ulysses*, the principal ambassador, at the head of the other:

———— ἀτὰρ κρέα νεῖμεν Αχιλλεὺς,
Αὐτὸς δ' ἀντίος ἔξεν Οδυσσῆος θεότοο,
Τοῖχος τῷ ἐτέροτο.

Also *Neptune*, though coming in last at a banquet of the gods, yet—

Ἐξετ' ἄρ' οὐ μέσσοι, —————

sat in the middle place, that being reserved for him, as of right belonging to him. *Jupiter* was at the head of one rank; next to him, on the same side, sat *Minerva*, his daughter and best beloved, who upon one occasion gave place to *Thetis*, but it is presumed from the courtesy of good manners, she being a stranger:⁹³

· Ή δ' ἄξα πὰρ Διὸν πατέρι καθέζετο, εἰξε δ' Ἀθήνην.

Juno led the opposite rank, and, being the sister and wife to *Jupiter*, gave place to none.⁹⁴ The most honourable places in beds at entertainments were not the same in all nations. In *Persia* the middle place was the chief, and assigned to the king, or the chief guest. In *Greece* the first, or nearest to the table. And among the *Heracleotæ*, and the Greeks who lived about the *Euxine* Sea, the first place of the middle bed was the most honourable. On the contrary at *Rome*, as hath been shown, the last or uppermost place of the middle, was preferred before any other.⁹⁵

It is related by *Plutarch* in *Timon*,⁹⁶ who having invited men of all qualities, citizens, strangers, friends, and relations, to a splendid entertainment, desired every man to lie down in that place which pleased him best: when many of the guests having taken their places, one in fine apparel, attended with a numerous retinue, came to the door of the room, viewed all the company, then presently retired; and being followed by some who were present, and requested to return, replied, “*There was no place fit for him.*” Thus men of proud tempers, on such and similar occasions, and like the *Jews*, who upon that account are reproved by our blessed Saviour, affected to have the chief places.

Some liberal entertainers disposed their guests in such an order as they thought would promote good fellowship and be conducive to harmony; placing men of the same years, professions, or tempers, next each other; or tempering the variety of humours by placing men of angry dispositions nearest the meek and gentle, those of silent tempers near the talkative. But in things of this nature there was no certain rule, every man followed his own fancy: whence it was assigned as a problem by *Plutarch*,⁹⁷

⁹³ *Iliad* ω', v. 100.

⁹⁴ *Conf. Plutarchus Sympos.* lib. i. quæst. 2.

⁹⁵ *Conf. Plutarch.* lib. cit. quæst. 3.

⁹⁶ *Idem Ejusdem libri, quæst. 2.*

⁹⁷ *Libro citato.*

“ Whether it was best to assign every man his place, or
“ leave the guests to take the places which happened
“ to them.” Lastly, on this head, we have only to add the
example of the *Lacedæmonians*, among whom it was cus-
tomary for the eldest to go before the rest, unless the king
gave the precedence, by calling any other.⁹⁸

The *table* now demands attention, which was accounted
ιερὸν χρῆμα, διὸ τὸν ὁ θεὸς τημάται φίλιος τε καὶ ξένιος, a very sacred
thing, by means of which honour was paid to the god of
friendship and hospitality:⁹⁹ this deity was *Jupiter*, who,
from his protection of guests and friends, received the titles
of ξένιος and φίλιος. *Hercules* also was honoured as having
a care of these entertainments. And likewise *Vesta*, who
was considered as the chief hospital deity, because she was
a symbol of the earth, which yielded all and received all
again; according to the expression of *Thales*, “ As the
“ destruction of the earth would occasion disorder and
“ confusion in all parts of the universe, so the table being
“ taken away, the whole house would be presently dis-
“ solved, the holy fire, and hearth, and entertainment, which
“ are the chief endearments of life, or rather life itself,
“ would be all destroyed.”¹⁰⁰ It was usual to ornament a
table with the statues of these divinities, and to consecrate
it by first placing the sacred **SALT**. This custom of consi-
dering the inherent sanctity of salt, is observed in numerous
passages of the poets, and is particularly mentioned by
the frantic *Cassandra* in *Lycophron*, who thus complains
of *Paris*, who had stolen *Helena* from the court of *Mene-
laus*, thereby contemning the civility shown him, having
been courteously entertained, for that he had overturned the
hospital tables and spilt the sacred salt. These are the
poet’s words:¹⁰¹

Ἐτλης θεῶν ἀλοιτὸς ἐκβῆναι δίκην,
λάξας τεάπεξαν, πάνακυπώσας θέμιν.

Whence *Cleodemus* in *Plutarch* calls a table thus con-
secrated φιλίων θεῶν βωμὸν καὶ ξενίων, “ *the altar of the gods
of friendship and hospitality.*” They also offered liba-
tions to the gods upon their tables. Hence also that senti-
ment of *Juvenal*,¹⁰²

Hic verbis nullus pudor, aut reverentia mensæ.

Those tables in the primitive ages were made of wood,
highly polished. Some say, and among them *Athenæus*, that

⁹⁸ *Eustathius* in *Iliad* β'. p. 186.

⁹⁹ *Synesius*, ep. lvii.

¹⁰⁰ *Convivio septem sapientum.*

¹⁰¹ Verse 136.

¹⁰² *Sat. ii. v. 110.*

they were round in form, in imitation of the Grecian conception of the shape of the world. Whilst others are not wanting, and among them is *Eustathius*, who allege they were of an oblong figure; which form indeed would be most agreeable to the before cited position of the guests, in long ranks. The tables were not covered with linen, but kept clean with wet sponges. Of this custom there are numerous examples in *Homer*:¹⁰³

Οἱ δὲ αὐτες σπόγγοισι πολυτερήτοισι τραπέζας
Νίξον καὶ προτίθεντο, ιδὲ κρέα πολλὰ δατεῦντο.

Arrian also says, ἄρεον τὰς τραπέζας, σπόγγοισον, “ *Take away the tables, cleanse them with sponges.*” Also *Martial*,

Hæc tibi sorte datur tergendi spongia mensis.

Latterly the tables of men of inferior quality were commonly supported by three legs, and made of ordinary wood, whilst those belonging to superior persons, were made of curious and foreign woods, inlaid with plates of silver and other valuable metals; and supported by one and often more feet, sometimes in the form and bearing the name of some heroes of antiquity, as *Atlantes*, *Telamones*, and others. The most common support of these tables were ivory feet *carved*, one author says *cast*, in the form of a leopard, lion, or some animal. It has been conjectured by some, that in the heroic ages, every guest had a separate table; whence *Athenæus* reports, τὸ μονοφαγεῖν ἐν χεήσει τοῖς παλαιοῖς εἶναι: be this as it may, the proof of it is not thought sufficiently strong. In the following ages, this practice, if it had existed, was discontinued, it being then thought inhuman to eat in that manner which was then a custom observed only by barbarians. *Tacitus* informs us this was usual among the *Germans*.

It has been also questioned, whether the tables themselves with the remains of the feast, were actually removed after a course, or whether it was only the victuals which were left: this ambiguity is occasioned from the table and its contents having only one name in *Latin* as well as in *Greek*. In the latter tongue it is *Τράπεζα*, in the former *mensa*.

The supper of the ancients, which was their chief meal, generally consisted of three courses. The following passage of *Alexis* in *Athenæus* appears to indicate that the tables with their contents were removed away together:¹⁰⁴

‘Ως δὲ τὴν τράπεζαν ἀνθεῶπος δύο
Φέροντας εἰσω ποικίλων παροψίδων
Κόσμος βείσσαν. —————

¹⁰³ *Odyss. a', v. 112.*

¹⁰⁴ *Lib. ix. principio, cap. 2.*

2d.—The second part was called $\Delta\varepsilon\tilde{\iota}\pi\nu\sigma\nu$, *cœna*, the supper; sometimes called $\kappa\varepsilon\varphi\alpha\lambda\dot{\eta}\ \delta\varepsilon\iota\pi\nu\sigma$, in Latin *caput cœnæ*: in this sense this passage of Martial is interpreted:

*mullus tibi quatuor emptus
Librarum cœnæ pompa, caputque fuit.*

This course was more plentifully supplied than the former, whence *Dromeas*, the parasite, is said to have made the before-cited observation, in comparison of the Athenian and Chalcian suppers.

3d.— $\Delta\varepsilon\nu\tau\acute{\varepsilon}\varrho\alpha\tau\acute{\varepsilon}\alpha\pi\acute{\varepsilon}\zeta\alpha$, the second course, which consisted of sweetmeats of all kinds, called by various names, and differently denominated by various of the *Grecian* people. This course was furnished with the utmost splendour, especially in those latter and luxurious ages, when *Greece* had bartered its liberty and heroic spirit for the gratification of sensual feeling.

The ancients appear to have had so great a sense of the awful presence of a divine Providence at their entertainments, that many thought it unlawful to eat before they had offered a part of their provision as first-fruits to the gods of hospitality. So strictly was this practice observed in the heroic ages, that we find it observed, by *Achilles*, who, though midnight when disturbed by the embassy from *Agamemnon*, would not eat till a libation was offered. The same observation applies to *Ulysses* in so horrible a place, as the den of *Polyphemus*. In the entertainments of *Plato* and *Xenophon* we find oblations are made: the neglect of this duty was considered an horrible impiety. And the same practice was also observed by *Aristotle*.

Previous to the entertainment, all the guests were apparelled in white, or some cheerful colour, to use the words of *Cicero*, *Quis unquam cœnavit atratus?* “ What person “ was ever found to sup in black ? ” that colour being left to times of mourning. It was also customary to deck themselves with flowers, or garlands composed of them, which the master of the feast generally provided, and which were brought in before the second course, or, as has been thought, at the beginning of the entertainment. They adorned their

heads, necks, and breasts with them, and ornamented their beds. *Ovid* celebrates this custom in the following verses:¹⁰⁴

Ebrius innexis philyra conviva capillis,
Saltat, et imprudens uritur arte meri.
Ebrius ad durum formosæ limen amicæ
Cantat, habent unctæ mollia sertæ comæ.
Nulla coronata peraguntur seria fronte,
Nec liquidæ juncto flore bibuntur aquæ.
Donec eras mistus nullis, Acheloe, racemis,
Gratia sumendæ non erat ulla rosæ.
Bacchus amat flores, Baccho placuisse coronam
Ex Ariadne sidere nôsse potes.

Garlands are said to have been first introduced by *Prometheus*, and used by men in commemoration of the chains he wore on the punishment he endured for their sake. It is also said they were invented by *Draco*, the *Corcyrean*. Others will have it they were first invented by *Janus*; who, they allege, also invented ships, boats, and the art of coining money; whence some Grecian and many Sicilian and Italian coins bear on one side a head of *Janus*, with two faces; on the reverse a boat, ship, or garland. Some again contend, and among them *Pliny*, that *Bacchus* was the original inventor; his garlands being made of *ivy*. That *ivy* was sacred to *Bacchus*, *Diodorus Siculus* proves, as appears in a former *article*; that it is admirably calculated for the use cannot be questioned; likewise antique statues prove its application for this purpose. Garlands are said to have been unknown in the primitive and heroic ages.

The guests, as we have seen, were also anointed and perfumed.

After each guest had eaten and drunk as much or sometimes more than did them good, they usually sung a hymn to the gods, then had other music: their musical instruments usually were a *lyre*, *tibicen*, and other stringed and wind instruments. Those instruments were usually offered round to the company to play on them. They had often professional people to play to the guests whilst at meals and afterwards. Occasionally they also danced; by the bye, it was thought a deficiency in education not to be able to sing, and play on the lyre, &c. and to dance. However, these customs are not to be understood as general among all Grecians nations, or universal at every feast.

Much the same were the Roman as we have described the Grecian customs.

They had also the practice of drinking to the gods first,

then to their absent friends, and lastly to toast each other. So that the present custom observed among us in drinking to and pledging each other, did not originate with the *Saxons*, as has been generally believed, but claims a vastly superior antiquity.

The time we have trespassed on the patience of the reader upon this topic must have exhausted his stock, and this consideration prevents a more particular minuteness in descriptions of many things usually connected with festival entertainments ; as the mode the healths went in different places, &c. which not being perhaps material, the mention is omitted, having to the best of our judgment touched upon those points most conducive to elucidate the ancient manners of this people.

As it is probable some of our readers may object to our use of the learned languages, in this and some other of our articles, to those we say, we hope to be read by the literate as well as the unlearned ; often finding occasion to approve what we have advanced, we found it necessary to use the identical language of the author to whom allusion is made, in support of our position.

BURIALS.

We may naturally conclude, that the necessity of burial existed with the first appearance of our species ; accordingly we discover this was the opinion of *Cicero*, and that of all modes of inhumation, that of interment was the most ancient.

De Leg. ii. 22. We have the means in our power to go a step farther, perhaps, than *Cicero*, by assigning the reason why.—A few years after the fall of our first parents, the first-born committed an homicide upon his brother : this appears to have been one of the first of human crimes upon record. In the powerful and figurative language of our sacred volume the malediction against the offender runs thus : “ And now “ art thou cursed from the earth, which hath opened her “ mouth to receive thy brother’s blood.” *Gen. iv. 11.*

The earth having received the blood of the first victim, thus the proper mode of burial was typically pointed out, and we presume our first parents judged it proper that the other remains of the slaughtered and righteous *Abel* should repose within the same material, where was already lodged its component part, the vital blood.

Innumerable are the instances where extreme solicitude has been shown in the patriarchal ages about the disposition of the dead. Thus *Abraham* pleads very pathetically with the sons of *Heth* for a burial-place for his wife, of

whom he purchased one in the cave of the field of Macphe-lah, which subsequently received the bodies of himself, his son Isaac, and his grandson Jacob.

A contemporary author of much celebrity of the present day¹ has said, “ *Barrows* are the most ancient sepulchral “ monuments in the world ; and their contents are as various “ as the different people that occupied the globe, or the “ different circumstances by which they were distinguished.” “ The pyramids of Egypt,” he adds, “ are but barrows of “ a more solid material, and the church-yard hillock of the “ present day is but a relic of their universal prevalence.” We are informed by *Diodorus Siculus*,² in confirmation of the preceding sentiment, that “ *Semiramis* buried her hus- “ band *Ninus*, on his death, in the royal palace in Nineveh, “ and raised over him a mound of earth of wonderful big- “ ness, being nine furlongs in height and ten in breadth : as “ *Ctesias* says, the city standing in the plain near to the “ river Euphrates, the mount may be seen many furlongs “ off, and looks like a stately citadel :” and he adds, “ and it “ is said, that it continues to this day, though Nineveh was “ destroyed by the Medes, when they ruined the Assyrian “ empire.”

The same author also relates the usual method of the disposition of their dead by the Egyptians, as follows : speaking of that people, — “ For after the death of any of them, “ all the friends and kindred of the deceased throw dirt “ upon their heads, and run about through the city mourn- “ ing, till such time as the body be interred, and abstain “ from baths, wine, and all pleasant meats, in the mean “ time, and forbear to clothe themselves with any rich attire. “ They have three sorts of funerals : — the stately and mag- “ nificent, the moderate, and the meanest. In the first they “ spend a talent of silver, in the second twenty minæ, and “ in the last they are at very small charge.

“ *Embalming*. — They that have the charge of wrapping “ up and burying the body, are such as have been taught the “ art by their ancestors. These give in a writing to the “ family of every thing that is to be laid out for the funeral, “ and inquire of them in what manner they would have the “ body buried. When every thing is agreed upon, they “ take up the body and deliver it to them whose office it is “ to take care of it ; then the chief among them, (who is “ called the Scribe,) having the body laid upon the ground,

¹ Dr. Rees, vide his *Cyclopædia*, article *Burial*. Perhaps he alludes to that of *Ninus*, which resembled a mountain in the plains of Nineveh.

² *Diodorus Siculus*, lib. ii. cap. 2.

“ marks out how much of the left side is to be incised and
“ opened; upon which the *Paraschista*, (so by them called,)
“ with an Ethiopian stone, dissects so much of the flesh as
“ by the law is justifiable, and having done it, he forthwith
“ runs away, might and main, and all those present pursue
“ him with execrations, and pelt him with stones, as if he
“ were guilty of some horrid offence; for they look upon
“ him as an hateful person who wounds and offers violence
“ to the body in that kind, or does it any prejudice what-
“ ever; but as for those whom they call *Tarischutæ*, they
“ highly honour them, for they are the priests’ companions,
“ and as sacred persons are admitted into the Temple.

“ As soon as they come to the dissected body, one of
“ the *Tarischutæ* thrusts up his hand through the wound
“ into the breast of the dead, and draws out all the intes-
“ tines but the reins and the heart. Another cleanses all
“ the bowels, and washes them in Phœnician wine, mixed
“ with divers aromatic spices. Having at last washed the
“ body, they first anoint it all over with the oil of cedar and
“ other precious ointments, for the space of forty days to-
“ gether; that done, they rub it well with myrrh, cinnamon,
“ and such like things, not only apt and effectual for long
“ preservation, but for sweet-scenting of the body also, and
“ so deliver it to the kindred of the dead, with every mem-
“ ber so whole and entire, that no part of the body seems
“ to be altered, till it came to the very hairs of the eye-lids
“ and eye-brows, insomuch that the beauty and shape of the
“ face seems just as it was before; by which means many of
“ the Egyptians, laying up the bodies of their ancestors in
“ stately monuments, perfectly see the true visage and coun-
“ tenance of those that were buried many ages before they
“ themselves were born; so that in viewing the proportion
“ and lineaments of their faces they take exceeding great
“ delight, even as much as if they were living among them.
“ Moreover the friends and nearest relations of the dead
“ acquaint the judges and the rest of their friends with the
“ time prefixed of the funeral of such a one, by name, de-
“ claring that such a day he had to pass the lake. At which
“ time forty judges appear, and sit together in a semi-circle,
“ in a place beyond the lake, where a ship (before provided
“ by such who have the care of the business), is hauled up
“ to the shore, governed by a pilot, whom the Egyptians
“ call *Xæpwv*: and therefore they say, that Orpheus, seeing
“ this ceremony when he was in Egypt, invented the fable
“ of Hell, partly imitating them in Egypt, and partly adding
“ something of his own. The ship being now in the lake,

" every one is at liberty by the law to accuse the dead
 " before the coffin be put aboard; and if any accuser appears
 " and makes good his accusation that he lived an ill life,
 " then the judges give sentence, and the body is debarred
 " from being buried after the usual manner. But if the in-
 " former be convicted of a scandalous and malicious accusa-
 " tion, he is very severely punished. If no informer appear,
 " or that the information prove false, all the kindred of the
 " deceased leave off mourning, and begin to set forth his
 " praises; but say nothing of his birth, (as is the custom
 " among the Greeks,) because they account all in Egypt
 " equally noble. But they recount how the deceased was
 " educated from a child, his breeding till he came to man's
 " estate, his piety towards the gods, and his justice towards
 " men, his charity, and other virtues, wherein he ex-
 " celled; and thus pray and call upon the deities to receive
 " the deceased into the society of the just. The common
 " people take it from the other, and approve of all that is
 " said in his praise with a loud shout, and set forth his
 " virtues with the highest praises and strains of commen-
 " dation, as he that is to live for ever with the just in the
 " kingdom of Jove. Then they who have tombs of their
 " own inter the corpse in places appointed for that purpose.
 " They who have none of their own, build a small apart-
 " ment in their own houses, and rear up the coffin to the
 " side of the strongest wall of the building. Such as are
 " denied common burial, either because they are in debt,
 " or convicted of some horrid crime, they bury in their own
 " houses; and, in after times, it often happens that some
 " of their kindred pay off the debts of the deceased to get
 " him absolved, and then bury their ancestor with state
 " and splendour: for among the Egyptians it is a sacred
 " constitution that they should at their greatest cost honour
 " their parents and ancestors who are translated to an eter-
 " nal habitation. It is a custom, likewise, among them to
 " give the bodies of their parents in pawn to their creditors,
 " and they who do not presently redeem them, fall under
 " the greatest disgrace imaginable, and are denied burial
 " after their death. One may justly wonder at the authors
 " of this excellent constitution, who, both by what we see
 " practised among the living, and by the decent burial of
 " the dead, did as much as possibly lay within the power of
 " men to promote honesty and faithful dealing one with
 " another."³

The author adds, in a subsequent place, that those wise laws were instituted by a hero of the name of *Mnevis*.

The same author subsequently says, “For they, the Egyptians, say that Orpheus brought over most of the religious rites and ceremonies, both as to what concerns the celebration of the *Orgia*, and relating to his wandering up and down, and the entire fable of hell; for, that the ceremonies of *Osiris* agree in every thing with those of *Bacchus*, and those of *Isis* and *Ceres* are one and the same, differing in nothing but the name. And whereas, he introduces the wicked to be tormented in hell; the Elysian fields for the pious and just, and the fictitious appearance of ghosts, (commonly noised abroad,) they say he has done nothing but imitated the Egyptian funerals. And the feigning Mercury to be the conductor of souls was derived from the old Egyptian custom, that he who brought back the dead body of *Apis*, (when he came to the place,) delivered it to him who represented *Cerberus*, which being represented by Orpheus to the Greeks, *Homer*, in imitation of him, inserted in his poem,

“ Cyllenius leads to the infernal strand
“ The hero’s ghost, arm’d with his golden wand.”

Adding,

“ They reach the efluxes of the swelling seas,
“ Then Leuca’s rock, thence on the wave they keep
“ To the sun’s portals, and the land of sleep;
“ When straight they come into a flowery mead,
“ Where, after death, departed souls reside.”

The name here of *Oceanus*, is attributed to the Nile, so the Egyptians in their language call it; the sun’s portals is also the city of *Heliopolis*, a city of the sun. The meadow feigned to be the habitation of the dead is a place near *Memphis*, bordering upon the lake *Arethusa*, surrounded with pleasant ponds, meadows, woods, and groves of aloes and sweet canes.

David eulogizes the sons of Jabesh-gilead, who rescued the bones of their king from the walls of the enemy. (2 *Samuel*, ii. 5.) Tobit is also praised, because he went about burying his murdered countrymen. Joseph’s body, being first embalmed, was put into a coffin or mummy case, and brought away by the Israelites on their exode from Egypt, as it should appear at the especial request of that patriarch.

Various nations have had, and still have numerous and

particular modes of disposing of their dead. The profane, as generally called, to contradistinguish from the sacred, but we choose the term *human*; then the human nations of antiquity, among whom occur our ancestors the *Celtæ*, the *Scythæ*, *Greeks*, and likewise the nations in the north of Asia and Europe,⁴ as well as barbarians, particularly those who inherited a martial spirit, universally were interred beneath *barrows*, *hillocks*, or *tumuli*, as called by the Latins, which we may learn from the tombs of *Patroclus* and *Achilles*, on the Phrygian shores of the Hellespont; those numerous tumulic remains which occur in a variety of places in this kingdom, in France, Italy, Spain, Russia, Denmark, Sweden, and in brief in most European countries; of which the lowly sod raised over the graves in our present church-yards is an humble imitation.

The Egyptians and ancient Greeks occasionally buried in their own houses, of which there are some few instances in scripture, among which that of Joab may be cited. In other respects, it was much more general to inter in caves, hills, rocks, and where the primary race of those respective people occasionally were compelled to reside, whilst in a state of nature. Such, at least, was the case with the

⁴ M. P. J. Von Strahlenberg's Historiographical Description of the North-East parts of Europe and Asia, speaks thus of SEPULCHRES. "The Russians call them "Borgi and Nulignii, of which vast numbers are found in Siberia, and the Tartarian "deserts bordering on that government, southwards. In these tombs were found all "sorts of vessels, urns, wearing apparel, ornaments, and trinkets, scimitars, dag- "gers, horse-trappings, knives, all sorts of idols, medals of gold and silver, "chess-boards, chess-men of gold; also large golden plates, on which the dead "bodies have been laid, (not unlike *Bractei aurei*, of some others of the ancients;) "clothes folded up, of the same sort as those the corpse was dressed in.

"The graves of the poorer sort have likewise such things as copper and brass "heads of arrows, iron stirrups, large and small polished plates of metal, mirrors "with characters, earthen urns, &c. &c."—p. 365, *ut supra*.

"As to the graves themselves, they are of different structures; some only raised "up of earth as high as houses, placed so near together, and in such numbers on "the spacious plains, that at a distance they appear like a ridge of hills: others "are set round with rough-hewn stones, and some with square free-stones are of "an oblong or triangular form. In some places they are of entire hewn stone. "In the ancient map of Tartary, are a number of pyramids, with these words in "Latin, *i. e.* "The pyramidal sepulchres of the Tartarian kings," which must "mean those monuments, though not properly pyramids." Colonel Kanifer (who had been a prisoner, as was our author, and whose residence was chiefly in the city of Janesei) told him that "the ambassadors of the Chinese Tartars, mentioned in *Das Verconderte Russland*, p. 9, whose expedition to the Kalmuck- "Ajuchi-Chan, on their return home passing through that city, desired leave of "the then governor to visit, but they were refused, from private reasons."

"The Jukengiri (a Tartar nation) hang their dead on trees, but the skeletons or "bones of their parents and relations they afterwards carry along with them "when they go hunting."—*Ibid*, p. 389.

ancient inhabitants of Greece, Sicily, many parts of Asia, and in Persia to the present day: and also of the Chinese. For, to instance only the case of *Naxi Rustan*, a Persian prince, who was buried among the mountains in the district of *Dejoces*, to the best of our memory: *vide Corn. Le Bruyn's Travels*, who gives a plate of the tomb. An anecdote is also related of the interment of a Chinese prince in a mountain, where he was buried with about 500 of his courtiers. Another anecdote is related of *Cyrus*, which appears to reverse the general disposition of nature; for he, if our recollection be perfect, desired to be so disposed of, that his remains might be most beneficial to his country, and accordingly wished for his body to be converted into manure for the land. The most singular practice was observed by the Ethiopians in the disposition of their dead, as related by the spies of *Cambyses*. “ After all the moisture is extracted “ from the body, (perhaps by the Egyptian process,) they “ cover it totally with a kind of plaster, which they make “ to resemble the original as near as possible; they then “ inclose it in a hollow column of chrystral, of which they “ have great plenty, and easy to work, through which the “ contents are clearly seen, without any disagreeable smell, “ or any thing which is offensive. This coffin the nearest “ relative keeps in his own house for twelve months, offering “ to it different kinds of victims and the first fruits of “ the earth. Afterwards these are removed, and set up “ round the city.”

The funeral ceremonies attending *Scythian* princes⁵ were very singular: they were first embalmed, afterwards carried through various provinces of their kingdom, till, at last, they were brought to the *Gerchi* in the most remote parts of Scythia, where the corpse was placed upon a couch, round which, at various distances, were placed daggers, and upon the whole, pieces of wood covered with branches of willow,⁶

⁵ *Marcus Paulus* observes, with respect to the funerals of the Tartarian kings, “ that every creature which met the corpse by the way was obliged to attend the “ deceased king to his grave, and accompany him for his service and retinue into “ the next world. This is, however, denied in his notes by the author of *L'Histoire Generale des Tartars*, p. 343. The Tartarian author, *Abulgasi Chan*, does not “ furnish a circumstantial description of the interment of *Zingis Chan*, his attention “ being chiefly genealogical.”

⁶ *M. P. J. Von Strahlenberg* relates of the *Jakuti* pagans on the interment of their dead, “ That what *Idebrand Ides* reports concerning this people in his travels “ is all true, except the custom of burying alive, or killing the oldest servants or “ favourites of a prince, at his funeral, which is abolished. *Ides's* report of those “ customs is similar to what *Marcus Paulus* relates of the funerals of the *Tartarian* “ kings, who says, ‘ that every creature which met the corpse by the way, was “ obliged to attend the deceased king to his grave, and accompany him for his

in a trench near the spot where the *Borysthenes* becomes navigable. In some other parts of the trench, one of the concubines of the deceased, having been previously strangled, with his baker, cook, groom, and most confidential servants, horses, and choicest effects, were burned, and a mound as high as possible raised over the whole.—*Herodot. Melp.* lxxii.

The Scythians, however, generally speaking, with regard to private individuals, were much more simple. When any died, the neighbours placed the body on a carriage, then carried it to the different acquaintance of the deceased, who prepared some entertainment for the corpse and its attendants, placing before the body the same as before the rest. Private persons, being thus carried for the space of forty days, were buried beneath mounds of earth. But this custom, even in Scythia, was not universal, for some suspended the dead body from a tree, and left it there to putrefy. Plutarch says to Theodorus, “ Of what consequence whether “ he rots in the earth or upon it?—Such with the Scythians “ is the most honourable mode of interment.”

It appears, that Diodorus Siculus was deceived from what has preceded with reference to the Ethiopians as to the exact mode of disposing of the body, for, he says, that it was customary to enclose the body in *glass*, evidently mistaking *chrystal* for that substance; yet he wonders how that could be done, well knowing that the heat essential for that purpose would destroy the corpse, or discolour it.⁷

Some of the inhabitants of Ethiopia, also, throw their dead into the river, as looking upon that to be the best sort of burial.—“ Some bury them in earthen coffins about “ their temples; and to swear by their manes is the most “ sacred oath.”⁸

It would seem, from what little has been shown, that the Jews as well as others usually buried their dead without the

“ service and retinue into the next world.” But they still own that formerly, “ before the Russians were among them, they were used to do so. They bury “ their dead divers ways; the most eminent among them pitch upon a fine tree, “ and declare he will be buried there; when the corpse is buried, they put some “ of the best moveables of the deceased along with him into his grave. Some “ only put the corpse upon a board, which they fix upon four posts in a wood, “ cover the dead body with an ox or a horse’s hide, and so leave it. Some again “ put the body in the ground; but the greater part, when they die, are left in their “ huts, whence the relations take the most valuable things, make the huts up “ close, and then leave them. Those who die in the city of *Jabalanski*, are left “ in the streets, where they are frequently devoured by dogs.”

⁷ Vide *Diodorus Siculus*, lib. iii. cap. 1.

⁸ *Ibid.*

city;⁸ such was, also, the case with the Athenians, the Smyrnæans, Sicyonians, Corinthians, and Syracusians. Examples are not wanting that similar customs were observed by the ancient Romans, or at least previous to the existence of the twelve tables, before which, and even subsequent thereto, if any were buried within the city, it was not without an especial permission from the Senators.⁹ This mode of interment was usual in Judea, as passages in their latter history will evince. The only people we remember who disregarded this custom, were the Lacedæmonians; the manly spirit, and heroic policy of their legislator, *Lycurgus*, desirous to eradicate every species of stupid superstition from the mind of his people, among other institutions directed they should often come near the dead, and had them interred in and near the temples; where monuments to perpetuate their virtues were erected, that the youth might be led from their infancy to behold such objects, nor dread the spectacle of death; and, likewise, that the mementoes of their memorial might be often viewed, and that the young might emulate the heroic virtues of their predecessors.

The Athenian practice, however, with regard to those who died in defence of their country, was at once so patriotic and affectionate, that it cannot but deserve particular attention, it affords an elevated idea of that polished people. About three days before the funeral the bones of the slain were placed in a tent, raised on purpose, so that every person might have an opportunity to frequent them, and pay the last tribute of a tear. All sorts of odoriferous herbs and flowers were strewed around the tent, and each man brought some in his hand, that he might consecrate them to the manes of his favourite friend. On the fourth day a coffin of cypress was sent from every tribe to carry off the bones of their own members; after which went an empty covered hearse, in memory of those who could not be found. The procession was carried on with a peculiar decency of sorrow, whilst great numbers of inhabitants, both strangers and citizens, assisted in the train of mourners.

The parents of the deceased attended at the sepulchre to weep. No eye could refrain from tears, and the melan-

⁸ The valley of Tophet without the city, in which was a water called *Gehennah*, which Milton names

“Black Gehenna, called the lake of hell.” *Paradise Lost.*
Presumed to allude to the oriental sense of the grave, the one being a synonymy of the other; when, like the Phœnicians, they immolated children.

⁹ *Cic.* de Leg. ii. 23.

choly distress which appeared in the faces of *the assembly*, seemed a true copy of the sentiments of all. The bones were accompanied in this manner to the public place of burial, situated in a pleasant spot without the city, called *Cermanicus*, and committed to the ground. The monument erected to the honour of these citizens was adorned with pillars, trophies, and inscriptions, such as were used about the tombs of the most honourable persons, and the ceremony concluded with a speech in praise of them all, the main scope of which was to animate the living with resolution, by commanding the courage of the dead; to infuse a spirit of patriotism into the minds of their fellow-citizens, by celebrating the principle of action which incites the valiant to battle. *Thucyd.*

The majority of both Greeks and Romans inherited a superstitious fear, and so firmly were they persuaded that if the body was unburied the soul was unblessed; imagining that all such who had not obtained a grave on earth, could find no rest in a future state, not being permitted to enter Elysium; but that the spirit of the deceased wandered for an hundred years on the shores of Styx, or hovered about the spot where the body lay: for that reason, the duty of interment was with them indispensable, as innumerable passages in their authors will abundantly prove. For this purpose their travellers whenever they met with a dead body, uniformly cast dust or mould upon it three times, and of these, one handful at least upon the head; this they did if their haste was ever so urgent.

Some persons, allowed the rites of burial, were distinguished by peculiar circumstances: those killed by lightning were buried by themselves, being thought odious to the gods, of which see *Plin.* ii. 54.; those who wasted their patrimony also forfeited the right of burial in their father's sepulchres; and those who were guilty of self-murder were disposed of privately, without the usual solemnities: those, likewise, who were considered public or private enemies to the state, such who betrayed their country; all tyrants, who were looked upon as enemies to their country and race; those who died in debt, whose bodies at Athens belonged to their creditors; and, lastly, those offenders who suffered capital punishment, but especially such who were exposed on the cross; this last superstition was also believed in *Judea*, whence the motive for the miserable death of our Saviour.

The learned antiquary of Greece, Dr. *Potter*,¹⁰ says,

¹⁰ Vide *Archæologia Græca*, vol. ii. p. 160. edit. London, 1722.

citing from *Diodorus Siculus*,¹¹ that “ *Pluto* was the first who “ instructed the *Grecians* in the manner of performing “ their last offices to the deceased, which gave occasion to “ the inventors of fables to assign him a vast and un- “ bounded empire in the realms below, and constitute him “ supreme monarch of the dead. And since there is “ scarce any useful art, the inventors whereof were not “ reckoned among the gods, and believed to patronize and “ preside over those artificers they had first instructed; “ no wonder if he who taught the rude and uncivilized “ ages what respectful ceremonies were due to the dead, “ had the honour to be numbered among the deities of the “ first quality, since the duties belonging to the dead “ were thought of far greater importance, and the neglect “ of them a crime of a blacker character, than those “ required by the living; for the dead were ever held “ sacred and inviolable even among the most barbarous “ nations; to defraud them of any due respect, was a “ greater and more unpardonable sacrilege, than to spoil “ the temples of the gods; their memories were preserved “ with a religious care and reverence; and all their re- “ mains honoured with worship and adoration; hatred and “ envy were put to silence, for it was thought a sign of a “ cruel and inhuman disposition to speak evil of the dead, “ and prosecute revenge beyond the grave: no provocation “ was thought sufficient to warrant so foul an action; the “ highest affronts from themselves whilst alive, or after- “ wards from their children, were esteemed weak pretences “ for disturbing their peace. Offenders of this kind were “ not only branded with disgrace and infamy, but by Solon’s “ laws incurred a penalty.¹² Of all honours paid to the “ dead, the care of their funeral rites was the greatest and “ most necessary; these were looked upon as a debt so “ sacred, that they who neglected to discharge them, were “ thought accursed; hence the *Romans* called them *justa*, “ the *Grecians* δίκαια, νόμιμα, νομιζόμενα, ἔθιμα, ὄστα, &c. all “ which words imply the inviolable obligations which na- “ ture has laid upon the living to take care of the obsequies “ of the dead.” The reverend prelate adds—“ And no “ wonder if they were thus solicitous about the interment “ of the dead, since they were strongly impressed with the “ opinion previously given, that they could not obtain rest till “ their bodies were committed to the earth.” To strengthen

¹¹ Diod. Sic. lib. v. c. 15.

¹² Demosthen. Orat. in Leptin. Plutarchus Solone.

his authority, he quotes the well-known passage in the *Odyssey* of *Elpenor's* request to *Ulysses*, who had fell from the top of the palace of *Circe*, whilst intoxicated, and was without a funeral. The hero had left him alive when he quitted the upper regions, and was surprised to find him an inhabitant of the infernal abodes: the shade implores him for the favour of a funeral when he regained the upper air, urging its request by the dear remembrance of the beloved objects he had left, his father, wife, and son; lest his body should go unburied, and he be considered a reprobate to the gods: adding—

“ This, this I beg, this earnestly implore,
“ Then will my soul to bliss be wafted o'er.”¹³ POPE.

Of all forms of death, the most terrible was that by shipwreck; whence *Ovid*, though willing to resign his miserable life, prays against this death:

Demite naufragium, mors mihi munus erit.

“ Death would my soul from anxious troubles ease,
“ But that I fear to perish by the seas.”

Whenever they were in danger of being cast away, they usually fastened the most valuable things they had to some part of their body, accompanied with a prayer to him who found the carcase to bury it; adding, it brought the reward along with it.

Persons backward in paying just respect to their dead friends, were excluded all the honours their country could bestow; whence, when any stood candidate for magistracy at Athens, inquiry was instituted whether they had taken due care in celebrating the funerals and adorning the monuments of their relations. It was also held to be extremely indecent to appear gay or pleasant before the ordinary time of mourning was expired. Thus it was objected by *Aeschines* to *Demosthenes*, as a crime, because he appeared in white apparel, sacrificing to the gods, before the ordinary time of mourning for his deceased daughter had expired.

The Athenian laws were careful, not only about those who had friends to solemnize their funerals, but also, there were magistrates termed *Demarchi*, who were enjoined, under a severe penalty, to solemnize the funerals of those whose friends might neglect these honours; and likewise to solemnize those of slaves, who frequently were without friends.¹⁴

If persons who had incurred public hatred had the good

¹³ *Odyss. x', v. 66. 72.*

¹⁴ *Demosthen. Orat. in Macart.*

fortune to have human burial, it was customary to leap upon their tombs, and cast stones at them, in token of abhorrence, a practice mentioned by Euripides, in his *Electra*:

————— ἐκθρώσκει τάφῳ,
Πέτροις τε λεύει μυῆρα λάϊνον πατρός.

“ ————— He leaps upon his parent’s tomb,
“ And in derision batters it with stones.”

It was not unfrequent at Athens, and in other parts of Greece, to punish notorious offenders by dragging their remains out of their graves, to which they were considered to have no just pretension. Sacrilegious persons were commonly thus treated: an instance occurs in the case of one *Cylo*, an ambitious nobleman, who, having seized the citadel, was besieged by the citizens, when himself and brother escaped, leaving his accomplices to the mercy of the besiegers; they flew for protection to the altars. As there was no method to draw them thence, but by the offer of pardon or submission, the magistrates made it: however, no sooner had the delinquents surrendered, than they were instantly seized, tried, and suffered; upon which fact, those magistrates themselves were afterwards arraigned and banished. But divine vengeance was not satisfied therewith, for after their death, their bodies having been privately buried in Attica, the oracle commanded their bones should be dragged from their graves, and cast out of the country.¹⁵

Thus, having stated the chief of what we find in antiquity relating to funerals, and dwelt rather long upon the subject; but particularly as it relates to Egyptian and Grecian customs, as we found them upon good authority, and trust they are not void of interest, we now propose to confine ourselves to what is discovered within the isles of Britain, for which we are chiefly indebted to Dr. *Rees*.

From discoveries which have been repeatedly made in various districts by our celebrated antiquaries, *Pennant*, *Gough*, *Stukeley*, and others, it is found that both cremation and interment were druidical and ancient British customs. The latter rite, however, appears to have been the most general, with the chimerical idea of furnishing the corpse in the lower world with such things as it was accustomed to in the upper regions, as clothing, arms, ornaments, and things the use of which are now to us unknown.

Barrows are the most ancient kind of sepulchral memorial in Britain, as in Asia; beneath some of which, urns have been found; under others, skeletons discovered;

¹⁵ Plutarch, *de serâ Numinis vindictâ*.

¹⁶ Vide *Cyclopædia*, article “*Burial*.”

sometimes the *kist-vaen*, or coffin, was composed of rough stones, set edgways; and at the sides and ends was another receptacle for the dead, anciently used in Britain; these are frequent in Wales, but seldom found to contain skeletons; rude stone chests, beneath barrows in the Orkneys. The last improvement of the stone coffin was by forming it of one stone chiselled out. Dr. *Pegge* ascribes this to the Roman colonists. Also instances of Roman coffins, composed of several pieces of stone, were found by *Gough*; vide his *Sepulchral Monuments*. We have seen a large stone coffin, with an antique inscription, in Malvern Abbey-Church. The Romans likewise used pure brick coffins, or baked *sarcophagi*. They usually buried their warriors near to some military way, or the *via strata*, whence the expression of *SISTE*, or *ASPICE VIATOR*, is presumed to have been derived.

Woden, the ancient King of our *Teutonic* ancestors, enacted a law for burning the dead, which not only the Saxons and Danes, but the remote *Sarmatæ*, and all *Scandinavian nations*, regularly observed; and tumulated the ashes with or without urns, according to circumstances. The *Danes* distinguished by this, are the last who forsook it. Accordingly their interments have been distinguished into different epochs, the *first* named *Roifold* and *Brentijde*, or the age of burning; the *second* called *Hoigold* and *Hoelfetijde* or the age of barrows or hillocks; at this period the corpse was buried entire, with all its ornaments, bracelets, arms, and even the warrior's horse, money, and all the riches of the deceased, thinking the soul was immortal, and would need these,—to excite to heroic acts: as their chief occupation consisted in piracy and other predatory courses whilst in a state of paganism. Their third age of burial they denominated *Christendoms-old*; this was subsequent to the introduction of Christianity among them.

From the remarks of the several writers above cited, with others, we learn that after Christianity had supplanted paganism, the custom of burning ceased among the several nations theretofore addicted to that practice. It appears that among the Britons it first fell into disuse; it was retained for some time afterwards by the Saxons, after they had obtained possession of this kingdom. It should appear the Danes retained this custom, with the errors of paganism, the last of all within these realms.¹⁴

With regard to the *barrows* or *tumuli*, it has not yet been actually ascertained to which people, who have been succes-

¹⁴ *Wolm. Mon. Dan.* p. 40.

sively inhabitants of this isle, they originally belonged, whether to Britons, Romans, Saxons, or Danes: but there appears reason to believe, that this mode of memorial was adopted by them all, at one period or other. Also, with respect to their construction, nothing decisive can be alleged, from the mode, to which of these various people they were erected. Some are formed of heaps of naked stones, as found in the isle of Arran, many parts of Scotland, and sometimes in Cornwall; others of a mixture of stones and earth, covered with sod or turf, nicely formed; whilst others are of earth alone. The size of the tumulus, it is understood, usually indicated the quality of the person inurned, *vide* that of **NINUS**, at *Nineveh*. The care employed to have the sod grow from turf, pared round about, and placed upon the mound, is thought to have indicated the last good wish, *sit tibi terra levis*. The generality of which were round, whilst others were conical; the round ones, we should suppose, belonged to the ancient Britons; for, as *Tacitus* says, their dwelling-houses were conically built. There are, near the city of Hereford, three large tumuli of a conical form, which we have repeatedly seen.

The urns were discovered placed in several positions, sometimes with the aperture downwards, sometimes with it uppermost, but uniformly guarded with flat stones.

The urns are not unfrequently found lodged in a small square cell of flags beneath a *cam* or *tumulus*. Mr. *Pennant* found no less than seventeen near Duppulin, in Perthshire, disposed in a regular form. The urns found in those cells are usually surrounded by scantlings of unburnt bones, which had resisted the fire; and the persons having the care of the last offices, were very careful to collect every particle, which they placed with the remnant of charcoal about the urn; considering a neglect an impiety.¹⁵

The Christian system made, as previously noticed, a great alteration in the mode of interment.¹⁶ Cemeteries altogether ceased. The Roman converts then buried in *sarcophagi*. The Britons did the same. The Saxons who succeeded these followed their footsteps in this respect. After the arrival of St. Augustine, in 596, and the conversion of the inhabitants, coffins, and placing the body to face the east,

¹⁵ See *Pennant's Wales*, loc. cit.

¹⁶ In burning the dead, they usually discovered that women were less combustible than men; whenever they had occasion to consume many of both sexes together, which was sometimes the case, they took care so to dispose the bodies, as for every woman to place at least ten men, the fat with the lean, &c. The ancients thought the speedy consuming of a body a peculiar felicity. See *Achilles* at the funeral of *Patroclus*, in the *Iliad*, &c. also *Potter's Greece*, vol. ii. ch. vi.

generally prevailed among this people, and those of most other Christian nations. The most ancient instance of a coffin on record, is that of *Etheldreda*, anno 695. (Sep. Mon. l. xxvii.) From thence downwards stone coffins prevailed, and may be traced from the ninth century to the reign of the third Henry, and even to Henry VIII.—(*Gent. Mag.* 1759, p. 66.)

Matthew Paris, in *vit. Albani*, p. 95, informs us, it was usual to bury monks, in the Norman times, naked in the bare ground, till *Warin*, the twentieth abbot of St. *Albans*, ordered they should have more decent funeral in *stone coffins*.

Also among primitive Christians the interment in cities was as unusual as in ancient Rome, nor in churches for many ages afterwards, for the first 300 years: the *atrium*, or church-yard, being the usual place of rest. Afterwards porches, or porticoes, leading to the church. Subsequently certain princes, bishops, founders, and some few others, found their way into the church, and even beneath the altar;¹⁷ but this was a privilege always at the disposal of the bishop. On the establishment of Christian rites, the disposal of dead bodies in their graves, as well as the living in the church, was directed that the one on rising should face the east, whilst the other in the service looked that way, and always towards the officiating minister. This practice in the Romish church was first introduced by *Gregory the Great*, and brought here by *Cuthbert*, Archbishop of *Canterbury*, anno 750, who directed, besides those regulations, that vaults should be made in churches, tombs and other mementa be erected, to remind the living to offer up their prayers for the dead.

It has been remarked, by an intelligent antiquary, that in ancient times, in this, and, perhaps, other Roman Catholic countries, interment was never practised on the north side of the church. An opinion prevails that it was left for malefactors, unbaptized, for suicides, and for such who had incurred the greater censures of the church: common observation will confirm the fact, at the present moment, that many more graves occur on the south than on the north side of our churches.

MUSIC.

The science of *music*, or rather of *harmony*, is extremely ancient; insomuch so, that, with respect to the latter, it is said to be coeval with nature herself. But as it has relation

¹⁷ *Lanfranc*, Archbishop of *Canterbury*, after he had rebuilt that cathedral, in 1075, was the first who built a vault under the altar.

to the science now in use, this, like most other arts, whose origin is very remote, is involved in obscurity; and in proportion to the astonishment and wonder excited by its uncommon powers, in a commensurate ratio does mystery, fable, and obscurity envelope its original. However, always remembering that it was from harmony,

— “from heavenly harmony, this universal frame began.”

DRYDEN.

Proceeding, step by step, it had eventually attained in Greece a very early perfection. An author justly entitled to the distinguished station held by all pupils of nature and of the muses, who is peculiarly eminent for what Horace denominates the *verbem ardens* of just poetical spirit, thus speaks of the heavenly science:

“ Arise, as in that elder time
 “ Warm, energetic, chaste, sublime;—
 “ Thy wonders in that god-like age
 “ Fill thy recording sister’s page.—
 “ ’Tis said, and I believe the tale,
 “ Thy humblest reed could more prevail,
 “ Had more of strength, diviner rage
 “ Than all that charms this laggard age,
 “ Ev’n all at once together found,
 “ Cæcilia’s mingled world of sound.”

COLLINS’S *Ode on the Passions.*

It will be, however, remembered, that the poet calculated as much upon the infant simplicity of nature as upon the uncommon powers of harmony; this consideration will certainly reconcile the apparent extravagance of the thought.

So great were the early powers of *verse* and *harmony*, that at one period the votaries to the muses were regarded as persons divinely inspired; they were the priests of man, his legislators, and his prophets. Insomuch was the possessor of the art, and the art itself, reverenced, that the responses of the most eminent oracles were received in measured verse. Witness the response of the *Delphian* oracle received by the Athenian deputation, when Greece inquired for her wisest man, as given by *Xenophon*. Vide *Memorabilia*.

Σοφος Σοφοκλης, σοφοτος Ευριπιδες,
 Αρδερον δε παντον σοφοτατος ΣΟΚΡΑΤΕΣ.

“ Wise is Sophocles, more wise Euripides,
 “ But the wisest of all men is Socrates.”

Music eventually claimed the most unlimited controul over the affections of mankind, as could be proved by an infinity of instances; we shall quote one only, from a well-authenticated fact, and finely illustrated, in that of *Timotheus*, from *Alexander’s Feast* of Dryden. To omit the hyper-

bolic representation of the raising of the walls of Thebes by the power of *Amphion's* lute, and the apparently incredible relations of the harmony of the harp of *Orpheus*, which are all personifications of natural effects, and which we have not room, time, or opportunity to explain in this place.

If its origin was as previously suggested by *Collins*, there is occasion to believe the shepherd's simple life afforded its first existence: in the native and wild notes of the pastoral reed, may be discovered the germ of a science as various as its effects are beautiful. We shall, for the present, presume the simple *Pandæan pipe* was the first effort of the construction of musical instruments; its soft tone being analogous to the dulcet harmony of the voice. We are led to suppose this from the evidence of ancient statuary, where those pipes are frequently discovered: and this will, perhaps, deduce its origin from the invention of the shepherd-god, or *oldest Pan*. Nevertheless, the *lyre*, or harp, is alleged from records to be the most ancient, having at first but three strings (see *Diod. Sic. b. i. c. 2*) analogous to the three seasons of the primæval year; the treble typical of spring, the tenor resembling summer, and the bass representing winter.

The invention of that instrument, and of music altogether, is claimed in the pagan world by *Amphion*, a successor of *Cadmus*, the first king of *Thebes*, in *Bœotia*, who is reported by the music of his harp or lyre, to have built the walls of that city: *Cadmus* having erected the citadel only. *Pausan. ii. 6. ix. 5. Ovid Met. ii. 178. Horat. Od. iii. 11. Art. de Poet. 394.*

About the year 1506, before Christ, *Hyagnis*, the *Phrygian*, first invented flutes, at *Celæne*, a city of Phrygia, and first played on the flute the harmony, called *Phrygian*, and other *nomes* (tunes) of the mother of the gods, of *Dionysius*, of *Pan*, and of the divinities of the country, and the heroes.¹ *Terpander*, also, who was the son of *Derdeneus*, the *Lesbian*, directed the flute players to reform the tunes of the ancients, and changed the old music, about the year 645 before Christ, as we are informed by the *Parian Chronicle*. The same *Terpander*, likewise, in the year 657 before Christ, added three more strings to the lyre.

When *Timotheus*, the Spartan musician, was banished his native country for having increased his strings to the number of *ten*, he sought refuge at the court of *Macedon*, and accompanied his patron, *Alexander*, into Persia, when that prince conquered *Darius*.

¹ *Parian Chronicle, Arundelian Marbles.*

From the sacred records of Judea we may also infer the invention of musical instruments at a date infinitely anterior to either of the periods above mentioned, when they inform us in *Genesis*, iv. 21, that *Adah*, one of the wives of *Lamech*, had two sons, the name of one of whom was “**JUBAL**,” who is said to have been “the father of all such *who* handle “*the harp and organ.*” This infers the anterior invention of that instrument.

Music consists of effects produced by the operation of certain sounds proceeding from the dulcet voice, or musical instruments, regulated by certain time, and a succession of harmonious notes, natural, grave, or flat, *i. e.* half a note below its proper tone; and acute or sharp, *i. e.* half a note above its proper key; and of such modulation of various tones, and of different value, and also of manifold denominations: the natural tones consisting of eight notes, with the addition of octaves, in various keys, with flats and sharps introduced to afford variety from the skill of the master, at different periods, to produce the most agreeable diversity in his composition; and sometimes according to the subject or words to which his music is adapted. Those musical notes, though proceeding from so small a number of radicals, are analogous to the incalculable, the endless forms, which orthography and rhetoric can afford to a well-informed orator, or elegant author, to embellish any subject. Thus from the definite number of twenty-four notes, varied in different degrees, by sharps, flats, semitones, &c. are produced all that is so magical, enthusiastic, and transporting in the empire of omnipotent music. Like as the alphabetic characters may be varied into myriads of forms suitable to every multifarious species of conversation or composition; in a word, a few musical notes in the hands of a master, may be made by his skill to produce, from agreeable interchanges of time, harmony, &c. every variety of musical sentiment which can affect the human soul. A stronger proof cannot be adduced than will be found in the before cited ode of *Alexander's Feast* of the truly poetic *Dryden*. In all which, harmony and melody form conspicuous characteristics.

And of **HARMONY**, according to the learned Mr. Mason. The sense in which the ancient Greeks viewed harmony, is as follows:—“ They, by that term, understood the succession of “ simple sounds according to their scale, with respect to acute-“ ness or gravity.” Whilst, it appears, that by *harmony*, the *moderns* understand,—“ The succession of simple sounds, “ according to the laws of counterpoint.” From the same authority,—“ By *melody*, the ancients understood the suc-

“ cession of simple sounds, according to the laws of rhythm and metre, or in other words, according to time, measure, or cadence. Whereas, the moderns understand by the same term, what the ancients meant by harmony, rhythm and metre being excluded.” “ And the modern *air*, is what the ancients understood by melody.” Hence from the preceding definitions, it appears, that what is now called *harmony* was unknown to the ancients: and that they viewed that term as we now see simple melody, when we speak of it as a thing distinguished from simple modulated air: and that their term melody was applied to what we now call air or song.

Should this be true, the long contested difficulty, and that train of endless disputes which has existed among the learned and scientific world so long, will instantly vanish. Should we suppose an ancient *tibicen*, or flute player, used an improper tone or semitone, or had he transgressed the mode or key in which he was playing, he committed an error in harmony; yet his melody might have been perfect, with respect to the laws of rhythm or metre; we should say of a modern musician, under similar circumstances, that he played wrong notes, or was out of tune, yet kept his *time*. Whoever made such a distinction, would be allowed to possess a good ear for music, though the moderns would be inclined to call it an ear for melody or intonation. By the rules of musical conversation, we should be justified when we call an instrument out of tune inharmonious, although the intervals were nearly right.

² By *harmonica*, the Greeks implied nothing more than that proportion of sound to sound, which mathematicians term *ratio*, or which would be understood in general musical conversation, by an *agreeable succession of musical notes*;—as ancient harmony consisted of *the succession of SIMPLE SOUNDS*, so does modern harmony consist of *the succession of CHORDS*.

Whether the *diatonic* scale be the effect of nature or produced by art, has occasioned disputation between many; but, without losing time or space, we are, we think, authorised, from general opinion to observe, that compositions formed on it, and on the plan recommended by a late

² Ptolemy Claudius, a learned Egyptian Monarch, who besides his being a commentator, geographer, astronomer, and mathematician, was also eminent as a musician; he vastly improved, by reformation, the ancient system of Grecian music, by simplifying their scales, reducing their number of modes from fifteen to seven, within the bounds of his octave. His writings on this subject, “ *Harmonics*,” have been translated by Dr. Wallis, to which the reader is referred.

organist, would produce sensations odiously disgusting to any musical ear.³

Memoir of HANDEL.—It may not be unacceptable to add a brief biographical memoir of one of the greatest composers who has ever existed, particularly as our plan professes to notice *improvements*; the subject of which is the eminently illustrious **GEORGE FREDERICK HANDEL**, a name dear to science, and entitled to the grateful veneration of the amateur in this divine art. He was born at *Halle*, in *Upper Saxony*, Feb. 24th, 1684: scarcely could he speak, before he articulated musical sounds. His father was a professor of the healing art, as a surgeon and physician, then upwards of sixty, who intended his son for the study of the law. Grieved at the child's predilection, he banished all musical instruments from his house. But the spark which nature had kindled in his bosom was not to be extinguished by the mistaken views of a blind parent. The child contrived to get a little clavichord into a garret, where, applying himself after the family had retired to rest, he discovered means to produce both melody and harmony. Before he was seven years of age, the Duke of Weissenfels by accident discovered his genius, and prevailed on his father to cherish his inclination: he was placed with *Zachau*, organist of the cathedral of *Halle*; when from nine till twelve years of age, he composed a church service every week. Losing his father whilst he was in that city, he thought he could best support his mother by repairing to *Hamburg*, where he soon attracted general notice. This wonder of the age was then only fourteen, when he composed *Almeria*, his first opera. Having quitted *Hamburg*, he travelled for six years in *Italy*, where at both *Florence* and *Rome* he excited much attention: at both which places he produced new operatic performances.

³ The *diatonic genera*, or *scale*, consists of one of the three genera in ancient Grecian composition, which in modern music implies a scale of sounds, consisting of a mixture of tones and semitones. This general tetrachord is produced by two tones and a semitone, as C, D, E, F,



and as it was from the succession of two tones, this *genus* acquired its name of *diatonic*, the term being derived from *Δια*, *by* or *through*, and *τονος*, *tone*; which passing from one tone to another, in Greek music, was never done, but in the diatonic genus.

The diatonic is the most simple genera in music, consisting of tones and major semitones; in the scale of which genus, the smallest interval is a conjoint degree, which changes its name and place, that is, passing from one to another; a prominent instance in this species of composition in modern music is “*God save the King*,” entirely diatonic, without modulation, by the intervention of a single flat or sharp.

In that clime of the harmonious muse, he was introduced to, and cultivated the friendship of *Dominico, Scarlatti, Gasparini*, and *Zotti*, with other eminent scientific characters: he was particularly caressed and patronized by *Cardinal Ottoboni*, in whose circle he became intimate with the elegant and natural *Corelli*. It was here he composed the sonata, “*Il trionfo del tempo*,” the original score of which is now in his Majesty’s collection: after which he went to Naples, where he set *Acis et Galatea*, in Italian, to music. Returning to Germany, he was patronized by the Elector of Hanover, subsequently George the First. In 1710 he visited London, by permission of his patron, who had settled a pension of £200 per annum on him. In London he produced the opera of *Rinaldo*, universally admired,—equal with all his other productions which had preceded. He was compelled to leave, however reluctant the task, the British shore, consistent with his engagement to his patron the Elector. He departed, not without exciting general regret, two years after his first arrival in this country. He soon appeared here again: his return was welcomed, like the rising of the genial orb of day before the wrapt Igniculist! But now seduced by the favour which awaited him,—he forgot to return. On the death of Queen Anne, who had also settled a like pension on him equal to what he received from the Elector, his former patron;—when that prince became the British monarch, our musician was afraid to appear before his Majesty, till, by an ingenious contrivance of *Baron Kilmarfyge*, he was restored to favour, Queen Anne’s former bounty doubled by the king; and the chief nobility having accepted of an academy of music under Handel’s direction, which flourished for ten years, till a quarrel between him and *Senesino* dissolved the institution, and brought on a contest ruinous to his fortune and his health.

He was particularly patronized by the great Earl of *Burlington*, the Duke of *Chandos*, and most of the distinguished British nobility.

Having restored his health from the baths of *Aix-la-Chapelle*, he for the future chose sacred subjects, which were performed at his theatre in Lincoln’s Inn-fields, Covent-garden, and Westminster-abbey. This determination produced those divine oratorios, which have been ever since performed in collegiate service and at Covent-Garden Theatre since his death; before which he was blind. He died in April, 1759, aged 65, and was buried in Westminster-Abbey, where he was honoured with a public funeral, six peers supporting the pall; the very reverend and truly learned translator of *Longinus*, Dr. Pearce, the Dean, and

then Bishop of Rochester, performed the funeral service with a full choir.

He had been a great benefactor to numerous public charities: the funds of the Foundling Hospital were improved through him with the amazing sum of £10,299. The organ in its chapel, and the MSS. score of his *Messiah*, were a present and donation to the foundation from him. He left an amiable private as well as a good public character behind him.

His character, as a composer, is too well appreciated, to require any remarks from our feeble and inharmonious pen.

THE SECOND PERIOD.

RHETORIC.

This period embraceth ornament united with utility; in which, although the latter may be the most prevalent,—nevertheless, as the art of persuasion must, from necessity, have been very soon resorted unto, we commence this period with *Rhetoric*; having given it, in its present improved state, the various degrees of progression may be anticipated.

§ 1. *Rhetoric* is a science which was considered as a branch of *Philosophy* by the early *Grecians* and *Romans*; and denominated by them *LOGICA, vel DIALECTICA*, being studied with *Logic* and *Moral Philosophy*.

It has been ever regarded as a liberal science, and its acquisition eagerly sought among all polished people; particularly in free governments, where individual talent could recommend the person possessing it to notice and distinction; because its rules are essentially necessary for direction in the attainment of those arts which secure public attention—in the cultivation of oratory and poetry.

It is a science properly classed in the Italian and French Academies with *Belles Lettres*, or fine writing. And although numerous English authors have treated of this science, some more and others less diffusive, yet few have done it completely or satisfactorily. Among those, however, the author who appears to have paid the most attention to it, was the learned and accomplished *Dr. Blair*, who wrote an elaborate and (with the exception of his having adopted certain false principles) a valuable work, published under the very modest title of “*Essays*;” which do great honour to his literary, and we had nearly said, philosophical ability; but, recollecting the circumstance

just mentioned, correct ourselves. It is on the whole, however, a work the best calculated, of any we have seen in our language, to answer the learned Professor's intentions ; and it is so much admired by us, that we have adopted its general design in this synoptical view.

Its Origin.—Although it is by no means certain when this science first had existence, it is conceived that, like its kindred and constituent art, Poetry, the object must first have had being, before any rules could be adopted for its regulation. This postulate granted, we presume some cool and discriminative critic sat down and prepared a code of legislative institutes for its government. Guided by similar principles, and directed by analogous motives to those which influenced the parent of the Peripatetics, in his poetical legislation ; both having discovered from what arrangement it was their judgment and their feelings were most sensibly affected.

The science now under consideration was, according to *Cicero*, *Orat. 32*, first introduced by *ZENO* of *Elea*, the founder of the *Eleatic* sect. It is a science which had the highest degree of cultivation in all the most eminent seminaries in ancient Greece and in Italy.

The Science.—Since all sciences consist of approved observations, in a certain series, upon intelligible and natural subjects ; so does the science under our present consideration depend upon the observance of certain principles which are essential to its perfection. It is universally assented unto that essential preliminaries to the study of oratory, as well as poetry, embrace a *proper* acquaintance with the *whole circle of liberal arts* ; also that the student should extend the sphere of his knowledge so as to encompass all human learning within its circumjacent periphery : as Grammar, knowledge of Languages, Philosophy, Geography, History, Poetry, Oratory, Music, Sculpture, Painting, Chemistry, Theology, Metaphysics, Astronomy, and, in brief, every other art and science which can possibly become the topic of consideration or of discourse in any society : of these, the student should possess, at least, a *general* knowledge. Those who propose to qualify themselves for any specific study or profession, should be careful to make the institutions which direct that peculiar study their especial care. A habit of incessant industry and laborious study alone can supply them with the materials ; when it becomes the province of Rhetoric to afford directions for the *arrangement* of those materials in the most judicious, convincing, and satisfactory manner. This is all that Rhetoric can do.

Habits of virtuous feeling are also highly essential; as are a tender and becoming sensibility to the woes, the injuries, and the sufferings of our race. The next essential preliminary, but certainly subservient to the preceding, is for the student to possess, in the highest degree of cultivation, an IMPROVED TASTE; which is defined to be “*The power of receiving pleasure from the beauties of nature or of art, and of experiencing pain from the deformities of either.*” The constituents of Taste are defined to be *delicacy* and *correctness*: *a delicate taste* enables us to recognise beauties which escape the vulgar eye; and *correctness* infers our judgment to be so improved by the correction of the understanding, that we are never imposed upon by counterfeit beauties, however plausible in appearance.

CRITICISM constitutes the *ultimate* of taste, being defined to be “*The application of taste and good sense to the fine arts.*” Its object is to distinguish what is beautiful from what is defective in every performance.

GENIUS is next to be considered:—although a genius of a vastly superior order may, indeed, compose a work, which shall be exactly conformable to the established rules of criticism; such, for instance, was *Homer*’s genius for sublime poetry; and such that of *Herodotus* for historical composition. Both these original authors, possessing exquisite taste, assisted by most profound judgment, produced works which all mankind have since admired. The term *genius* is also applied to an aptitude in particular minds for many specific objects, which do not immediately come within the cognizance of the present consideration; but the definition of that term with respect to such objects that meet its attention, will be found to be “*The result of a lively and rapid perception, carefully collecting, strenuously retaining, and skilfully arranging whatsoever is estimable in any specific art or science.*”

Nature and time deny their assistance to the production of an *universal genius*, although they may assent to the produce of a genius, equally or indifferently disposed to several objects. But time or opportunity deny, and experience confirms their dispensation; and the instance is yet unknown where an individual has excelled in the cultivation of several arts; life being too short; besides, it is essential for the whole faculties of the individual to be concentrated in the particular object of his attention. This question is

* The chief instances we recollect of a genius of this species succeeding, are in the very rare examples of Pythagoras, Ptolemy, and Michael Angelo; but these are not every day productions.

of the highest moment to the ardent, the young, and the inexperienced.

§ II. **SUBLIMITY**, as a constituent of taste, now presents itself,—partaking of several features; but its grand and universal characteristic appears to be whatever is concealed from human conception, *i. e.* mysterious: and it is the more complete, if aided by circumstances of grandeur, vastness, extension or variety of appearance: whence, of all abstract conceptions, the most sublime idea man can possibly conceive is that of the **DEITY**; because, in that conception, he includes all the previously stipulated particulars: as that *idea* is the ultimate of all sublimity, so also are well constructed passages *attempting* description grand and sublime. When, for instance, we are told that “His pavilion is in “darkness!” or when, on the contrary, the wrapt Psalmist assures us, that it is in the centre of unapproachable light, *In sole posuit tabernaculum suum*, as in Psalm xix. 4. This idea, joined with the infinite conception raised by the consideration of his attributes, assuredly renders it as sublime an idea as can be possibly conceived. It is the sublimity of admiration, reverence, and awful grandeur. How different is this, indeed, from the sublimity created by horror; produced by reading a passage in *Lucan*, his description of the *Masillian* grove.²

Beauty, Delicacy, Motion, Grandeur, and Novelty, are also fertile sources of those pleasures contributing to the produce of the generic term *Taste*.

Satire and Ridicule likewise contribute a constituent part.

Moreover, a period or sentence is not perfect, if it be deficient in melody and harmony; with which we conclude our enumeration of its component parts. So that we observe in the construction of good language alone, the chief heads to be considered consist of,—the previously stipulated qualifications of the student’s mind, to which must be added, the perfection of correct taste;—proper ideas of what constitute sublimity and the other characteristics of language;

² Vide Maurice’s *Babylon*, p. 106. The famous Spanish poet thus describes this grove as—“A place gloomy,—damp,—and scarcely penetrable;—a grove in which no sylvan deity ever resided, no gentle zephyr ever played,—nor even the lightning itself could rend a passage. It was a place of blood and horror,—abounding with altars reeking with the gore of human victims, by which all the trunks of the trees were dyed of a crimson colour; a black and turbid water rolled through in many a winding stream: no soul ever entered the forlorn abode, except the priest, who at noon and midnight, with paleness on his brow, and tremor in his step, went thither to celebrate the horrible mysteries in honour of his terrific deity,—whose aspect he yet dreaded more than death to behold.”

what constitutes the beauty of periods, which we observe to consist in *clearness, unity, strength, and harmony*.

Clearness is opposed to ambiguity, and it chiefly consists of *purity, perspicuity, and precision*:— to obtain purity and perspicuity much discrimination and exquisitely improved taste are requisite, in the selection of proper materials, consisting of perspicuous and harmonious words, formed of a due mixture of vowels and consonants. A period should be also properly arranged, which may be attained by placing those words which have a natural relation to each other, as nearly together as possible; so as to render the speaker's or writer's view of his subject as distinct and perspicuous as it can be made.

Clearness and precision are the distinguishing characteristics of our tongue. Precision and unity appear to constitute its *strength*.

Independent of a sentence being clear, united, and strong, that is, fully adequate to our meaning;—if it be *inharmonious*, it is yet deficient. As a discourse consists of a proper succession of periods, so is a period composed of significant compound and simple phrases, which should be so constructed as to introduce its **SUBJECT** in some conspicuous and prominent situation, generally at the beginning or end, according with its idiomatical construction: if it be possible, each member of a period should rise in proportion as it advances towards its close; as should also each period be enhanced in value and proportionate importance, as it draws to the end of a discourse. To procure harmony, which is the last subject we have, at present, to consider, the previous suggestion respecting the choice of words must be first attended unto: next, as every period is divided into its phrases, and their component parts, by certain arbitrary marks, called *points*, in number, four: 1st, a comma (,); 2d, a semicolon (;); 3d, a colon (:); these must be so arranged as to bear a proper musical relation to each other, which should be mathematically correct, although in *general* practice it is arbitrary. The proportion of time observed in delivering a properly punctuated discourse is as follows: the colon occupies double the time of the semicolon, the semicolon double that of the comma; the conclusion of a period is marked by a single point, thus (.), or, what is called a period, which occupies twice as much time as the colon.

§ III. Of the **CHARACTERISTICS of several Kinds of Writing**: consisting of **HISTORICAL, PHILOSOPHIC, ETHIC or MORAL, EPISTOLIC; and FICTIONAL HISTORY**.

As these differ very materially in character, it is thought

proper, that even in this brief description their distinction should be marked.

History is defined to be the record of truth: hence its chief requisites are impartiality, fidelity, gravity, and dignity. In the conduct of an historical detail, the historian should be anxious to preserve his unity. Its proportions should be so connected, as to produce a whole; one entire relation of an event, or of events relating to a certain kingdom, &c. *Polybius*, among the ancients, is considered as remarkable for this quality, though rather an inelegant writer in other respects. An historian should trace actions and events up to their sources: to effect this, he should be conversant with *human* nature as well as *political* knowledge, because his skill in the former will enable him to describe the characters of various individuals, and to develope concealed events; whilst his proficiency in the latter will prepare him for recording revolutions in governments, and for accounting for the operation of many important causes affecting public affairs. Respecting political knowledge, the moderns enjoy vastly superior advantages over the ancients, from those improved habits of modern society, which have introduced among them a more ready and universal communication; there being among the ancients no foreign posts, or resident ambassadors at distant courts: likewise, there now prevails a more extensive experience of the different modes of government, the resources of various nations, their foreign connexions, &c. with regard to relief from distant colonies; and a great number of other advantages might be enumerated, which have lent their aid to improve the modern beyond the histories of ancient times.

However, it is in the form of his narrative, and not by any affected mode of dissertation, the political skill of the historian is to be conveyed. The former has the air of design; it intimates that the historian is willing to accommodate his facts to the support of some theory, and it betrays his evident want of art. Reflections of any description may be introduced easily into the body of a narrative.

Clearness, order, and suitable connexion, are the great historical virtues; they may be easily attained, when the historian is so much a master of his subject, as to have a complete view of the whole, and to comprehend its dependant parts. History, being a dignified composition, should be grave; and, from its importance, commanding:—consequently, there should be nothing ignoble, mean, or vulgar in the historic style, no quaintness, smartness, pertness, or flippancy; even *wit itself* should *not* be admitted. History should be interesting, and this circumstance chiefly distinguishes the

genius and eloquence of the writer. To effect this essential, he, the historian, must steer clear between a rapid recital and prolix detail; he should know when to be concise, and when to enlarge, and where to make his selection of proper circumstances.

In those qualities, the ancients far excel the moderns; likewise in affording a variety: from their introducing the speeches, orations, &c. of their eminent historical persons in the body of their work. *Thucydides* first introduced this practice: this improvement affords a great insight into ancient manners; also, it presented admirable political and moral instruction. *Tacitus* excelled in it. In this respect, the moderns may claim, *perhaps*, superior chastity; by delivering, in the person of the historian, those reasonings and sentiments of their historical personages.

The most splendid feature in history, and that which best informs us of the ability of the historian, is the *delineation of character*. These being considered as specimens of fine writing, universally proclaim the merit of an author, proportionate to their truth and justice. An accomplished historian despairs to dazzle by the too frequent use of rhetorical figures; *equally* removed from *meanness* and *affectation*, he is *only* solicitous to be natural, and to observe the line of truth.

Voltaire introduced a most legitimate feature of historical composition, in furnishing a correct detail of the effects of political and moral causes.

Another species of historical composition are *Lives* and *Memoirs*; but *Annals* are more particularly of this *genera*. *Lives*, or *Biographical* writing, are a species less stately than history, but *perhaps* more instructive: as histories chiefly relate to kingdoms, great events, or very eminent personages, whereas biography applies to individual concerns in every station, and serves to direct private judgment in all affairs of consequence, and their general vital management. *Plutarch* and *Cornelius Nepos* are the most eminent Biographers of Antiquity.

Memoirs are compositions which do not pretend to hold out a complete and regular detail of any certain period, nor to be constant to that to which it refers, but only recounts circumstances relative to any person or transaction which came within the author's own knowledge, or which had been specifically detailed to him. It is required of an author of this class, that he be lively and interesting. The French are famous for this species of writing; and the *Memoirs* of *Cardinal de Retz*, and of the *Duke of Sully*, are considered to be excellent of the kind, as, joined to the

previous requisite of liveliness, they evince great knowledge of human nature and much converse with the world: they are also full of virtue and good sense, and well calculated to instruct the heads, and form the hearts of those who read them; and will be found peculiarly serviceable to those intended for exalted stations in life.

Philosophical Writings and Dialogues. — As the professed object of the Philosopher is to instruct, he is found regardless of the beauties of composition; but they are not to be wholly neglected: for the philosophical writings of *Plato* and of *Cicero* are, surely, to be preferred to those of *Seneca* and *Pliny*. Precision and accuracy are chiefly looked for in the style of the philosopher; that these qualities may be possessed without dryness, the two former examples will evince.

Among the ancients, philosophical writing often assumed the form of *dialogue*, in which species of writing, *Plato* is not to be surpassed by any ancient or modern: the only fault he is accused of, is the amazing fertility of his imagination, carrying him often into allegory, mysticism, fiction, and enthusiasm. *Cicero's* dialogues, besides embellishing philosophy, are valuable records of the manner in which conversations were conducted among the principal persons of ancient Rome. *Lucan* is a model for humourous dialogue; *Fontenelle* for sprightliness and being agreeable; those of Dr. Henry Moore and Bishop Berkeley are extolled for several beauties.

Ethic or Moral Writing. — Didactic discourses have for their professed object the improvement, if not the reformation of mankind; as they establish some great and useful truths: inasmuch, as they refer to the former, they partake of theological composition, and as they approximate to the latter, they may be said to participate of the nature of philosophical discourses. Their ultimate object is to inform the understanding, correct the morals, and to amend the heart. Although didactic themes are generally treated poetically, yet they do not refuse the dress of humble prose; being introduced in the form of a narrative or exemplar, containing some highly interesting incidents and new situations, where great art is required to extricate the persons concerned.

Of this description are the *Telemaque* of *Fenelon*, the Tales of the Genii, by the Rev. *Gloucester Ridley*, the Moral Tales of *M. Marmontel*, which are all excellent. Such fictitious dresses are resorted unto by writers, for the purpose of affording instruction, where the reader's imagination is amused at the time his understanding is instructed. To avoid the stiffness and formality of a divinity lecture, moral truths with instructive examples are promulgated under the

semblance of amusing narration ; and here fable is made subservient to the purpose of truth. The *generic* character of *didactic* composition may be collected from what has preceded ; being an agreeable intermixture of fact with fiction, to the embellishment of moral truth.

Epistolary Writing.—This species of writing is chiefly characterized by ease and familiarity ; much of its charm depends upon its introducing us to the acquaintance of the author and his friends. Its rudimental requisites are nature, simplicity, sprightliness, and wit. Letters should assume the ease of familiar conversation, should bear no mark of care or study. *Cicero's Epistles*, and those of *Pliny* the younger, are eminent models among the *Romans* : those of Lord Bolingbroke, Bishop Atterbury, Mr. Pope, Lady M. W. Montague, among English writers ; and of *Balzac*, *Voiture*, and Madame *De Sévigny*, in French, are all eminent for various excellencies.

Fictitious History.—This class of writing includes a very numerous, and generally, an insignificant class of productions, denominated Novels and Romances. Of these, though the influence is known, and, perhaps, *properly* appreciated, being generally introductory to false reasoning and licentious principles ; yet, if in proper hands, we have seen the good effects it is capable of producing. It was sagely observed by the philosopher, Lord *Bacon*, that even the wisest of men, in various nations, have at times needed the instruction of fiction for the propagation of knowledge ; and if the common affairs of the world are not sufficient to engage the human mind, they may create worlds of their own, and wander in the luxuriant regions of imagination.

From the Ionian and Milesian tales of *Greece*, this species of composition has assumed various forms ; from the romantic fictions of France and Italy, in the dark and middle ages, to the production which subdued the spirit of generous but extravagant chivalry, the witty and natural *Don Quixote* of *Cervantes*.

The next stage was the *Cleopatra* of Madame *Scudier*, and the *Arcadia* of Sir *Philip Sidney* : this form of writing at length dwindled into the familiar novel. Interesting situations in life constitute its basis. The French have been eminent in this species ; as the *Gil Blas* of *Le Sage*, the *Marianne* of *Marivaux*, and some few others, will testify. In this mode of writing the English are thought by some to be inferior to the French ; yet we have writings of this class, which evince considerable strength and much genius ; among whom *De Foe*, *Fielding*, *Richardson*, *Goldsmith*, *Smollett*, *Robinson*, *Opie*, and *Miss Porter*, are all eminent

names; although the general run of these performances under the name of Lives, Tales, Adventures, &c. are of a character, that, did they not merit reprehension, would be beneath contempt; from the encouragement they afford to idleness, dissipation, and other vicious principles which they are calculated to inculcate in the weak portion of humanity.

Of Figurative Language.—Figures are defined to be that language, which is either suggested by imagination or the passions, and are generally divided by rhetoricians into two chief classes; *i. e.* figures of *words*, and figures of *thought*. The former are called *Tropes*, and consist in a word being used to signify something which is different from its original meaning, thus:—*light* is used for moral purity, in this expression, “*light ariseth to the upright in darkness.*” Should the word be altered, the figure is destroyed. The trope here consists in light and darkness; not being taken literally, but meant to express comfort and adversity, to which conditions of life they are presumed to bear some resemblance. The other class, called figures of thought, supposes the figure to consist in the sentiment only, whilst the words are used in their literal signification, as in exclamations, interrogations, apostrophes, and comparisons; where, although the words are varied, or even translated from one language into another, the same figure is still preserved.

Tropes may be said to derive their original from the poverty of language; whence, perhaps, the cause of the richly figurative language of the oriental world, which growing up whilst language was yet in infancy, many bold and highly poetical images were borrowed from natural objects, to express things which could exist only in the mind. By way of explication, we should observe, that the imagination occupies so great a share of controul over our ideas and their expression, that that property in the imagination of associating ideas, prevents our contemplating any idea singly; we have always a great variety of associated thoughts accompanying our conceptions, where the associate or accessory thought often supercedes the principal,³ being often employed instead of the chief conception. Thus, the growth of states bearing a natural analogy to the progress of vegetable life, “*the Roman state was said to flourish* most whilst under the government of *Augustus.*” So also is the leader of a faction compared to that member of the body from whence all its motions are presumed to proceed; thus *Catiline* was called the *head* of his faction.

We may now inquire why tropes and figures give beauty

³ Vide the subsequent article, *Logic.*

to language and grace to style. In the first place, observing that they contribute amazingly to the stock of expressions in a language; from whence, as the beauty of language consists in its variety of expression, in suitable and appropriate epithets, such diversity is by this means afforded to language, that it will admit of the greatest richness of expression: we have also by these means the opportunity to express all our innumerable conceptions, and to distinguish the various shades of impression in their most minute tints of colour, as well as in generic diversity of character. Figurative expression also communicates much dignity, as well as elegance and pathos, to language. By means of figurative modes of expression, the most delicate shades and colour of our thoughts can be given, when mere names, words, &c. would ill suffice to answer the intention of a writer or orator. It may be observed, by way of instance, that the advantage of this mode of expression will appear in the following. That the sun rises is an expression trite and common, but in the way Homer has expressed it, it appears extremely grand and superlatively beautiful:

“ *Aurora* now, fair daughter of the dawn,
“ Sprinkled with rosy light the dewy lawn.”

POPE’s *Iliad*, lib. viii. v. 1 and 2.

How much is the idea enriched by the personified figure of the goddess of morning illuminating the earth and general nature, and ushering in the king of day.

Figures also furnish the pleasure of a double enjoyment at the same moment, and without confusing the ideas, that of the principal idea and its auxiliary; instanced in saying “ *the morning of life*. ” Here the fancy is entertained with every corresponding and analogous circumstance which can occur between those two objects: at the same instant the jocund spring of time is brought to our view with all its attendant beauties, the birth of the day is also represented in all its loveliness. The imagination, being busily employed, frolics between them with delight, viewing at once with rapture two similar objects, rendered clear by recollection of various pleasing associations, unembarrassed and without confusion.

Figures, moreover, afford clear views of the chief image, when they add to its beauty, by furnishing rich attire to the thoughts. They also can transform an abstract conception into an object of sense. Thus Dr. Young says, “ when we “ dip too deep in pleasure we always stir a sediment, which “ renders it impure and noxious.” An image presenting such an idea of resemblance between a moral and a sensible conception, answers the purpose of an argument from analogy, to enforce what is advanced and to produce conviction.

Tropes are founded on the relation that one object bears to another in resemblance; a part, therefore, serves for the whole, or reciprocally the whole for a part. The effect is also often put for the cause, and *vice versa*; a genus for the species, and a species for the genus; singular for plural, and plural for the singular.

ON POETRY.—It may be asked, what is poetry? and wherein does it differ from prose? Although it will appear this question has excited some debate, yet it seems to us to be easily resolvable; since its essence is alleged by *Aristotle*, as well as *Plato*, to consist in **FICTION**: but prose as well as poetry may be fiction; therefore we should have a more definite illustration, which we propose to supply in the subsequent observations. It may, taking this for a definite characteristic, be said to be an agreeable manner of relating some circumstance *or fact*, which, for the sake of rendering fascinating, becomes requisite to be adorned with the charms of verse; this communication of the poetic character necessarily brings with it—fiction: consistent with the opinion of the above-named Grecians, fact and fiction constitute the character of poetry, which is an agreeable manner of relating some event in suitable thoughts and measured numbers.

Our very elegant and ingenious countryman, Mr. Pope, has contended that its characteristic consists in *invention*; thereby, perhaps, agreeing with the above definition, only using *another name*.

But with all deference to these respected and able authorities, we submit, that all these definitions hold good to a certain species and a given extent only; and that neither of their definitions embrace the general and legitimate poetic character. According to our conception, the genuine character of poetry consists in either the *sublimity, grandeur, beauty, elegance, variety in appearance of objects, or loftiness of the thought*. “That the character of the circumstance, “according as it is influenced by either of these, communicates to the description a portion of its own spirit, and as “that either tends to depress the thoughts, or to elevate “them, so it becomes prose in its various degrees and designations; or, as it elevates the conception, it becomes “poetry of different degrees of character.”

Contending that although numbers, or measured harmony, are generally given to what is called poetry, yet they are by no means essential thereto; and that poetry of the most sublime kind can exist without either,—we cite the example of innumerable texts of scripture, to be discovered in *Genesis, Job, Isaiah, Psalms, Ezekiel, the Song of Deborah*,

&c. &c. &c. without end, of the most exalted poetical character.⁴

We much regret we have not room to adduce specific instances, and point out their various excellencies; but we refer our readers to what Dr. *Lowth* has said upon “the poetry of the Hebrews.” *Homer*, *Ossian*, and other eminent productions, establish our conception.

We also again repeat the observation, that the original instructors of man, his legislators, priests, and prophets, were poets, all being believed to be blessed by the favour of the muses; therefore they were presumed to be superior to common mortality, and thought to be divine. As civilization lent its assistance towards improving the moral character of the species, matter of fact, from its importance, became superior in its influence on general humanity to poetical fascination: whence philosophy and the sciences introduced prosaic composition, as in the origin of language it assumed the stately garb of poetical numbers.

Poetry must be regarded as the language of an imagination warmed by its object; it may be said to be *the language of passion and sentiment*. This is its definite character, though established practice and universal custom hath long lent assistance to confine its airy form, its impassioned nature, to narrower limits; shackling it in numbers, and even strangling it with rhyme!—*O miserabile dictu!* alas! to what will the muse be next reduced?

Rhetoric now takes her station: while she is discussing the laws of poetical composition, she smiles benignly on her subject; classes it into its different species, and with matronly judgment assigns technical expressions to every figure, which she recollects from Greece, directs verbal choice, and supremely legislates for its moral government.

We much regret that our limits will not permit a *general* view; however, definitions of the most usual objects shall be given. Having first observed on the different classes of poetical composition,

Lyric Poetry claims a primary pre-eminence from its early use. Its characteristic is passionate warmth and irregularity.

Didactic Poetry comes next; its characteristic is instruction, and of several species. May be relieved by episode, and enlivened by other poetical figures.

Descriptive Poetry is of several species, varying in cha-

⁴ The very musical genius of the harmonious Pope, has familiarized rhyme to the English taste, it could not have an abler advocate; but that rhyme is an essential constituent to poetry, we deny.

racter, and takes several names, as *georgic*, *beaucolic*, *piscatory*, &c. &c. varied according to circumstances.

Satirical and Epistic.—These resemble each other somewhat, in certain points of character. The first is calculated to expose folly and lash vice, by showing the weakness of the former, and the disgusting nature of the latter, generally, applying particular invective against the nature of crime, then holding up the criminal to public odium and contempt. It renders the offender the corrector of himself, and makes others abhor his practices. The latter participates so much of the nature of *didactic* poetry, so that description will suffice. Its theme being generally what its name imports, familiar epistles, or else discussing philosophical or ethical subjects.

Hebraic poetry is chiefly distinguished by the sublimity of its subject, the majesty of its conceptions, and the splendour of its imagery. Being described in the introduction, that may now suffice.

Epic or *Historical* poetry, besides the last-mentioned species, is the loftiest of what is known as human composition; generally interspersed with episodes, greatly contributing to its beauty.

Dramatic poetry consists of *tragedy*, *comedy*, *opera*, and *farce*. The first is generally confined to great events, where eminent personages are represented suffering, although it does not exclude great sufferings and a mortal catastrophe in humble life. The second is sometimes sentimental; at others, satirical; the former description of this class delights in delicate situations and interesting events: the latter professes to represent a faithful picture of the times, “*their form and pressure*,” for the purpose of correcting the excesses of vice and the follies of the day. The third is generally confined to the Italian theatre, consisting chiefly of musical recitatives, airs, chorusses, songs, &c. The scene represents some highly interesting event. When we have native operas, they participate in a certain degree of the character of the Italian, at least, as far as music is concerned. And the fourth is generally a light, and often a loose performance, calculated to excite mirth, and afford relief from the more serious business of the stage.

METAPHOR, being entirely founded upon resemblance; to complete a metaphor, is to preserve the just resemblance between the whole, and also in every part. When it is said of a great minister, that—“ He upholds the whole “ weight of the state, like a pillar which supports a massy “ edifice,” it is evidently a comparison; but when such an one is called “ A pillar of the state,” it is to every

intend a metaphor. There are many rules for the construction of metaphors: 1st. That they be applicable to the nature of the subject; neither too numerous, too gay, too elevated for it; not to force the subject into an elevation unnaturally,—by doing so, *bombast* is produced; nor to suffer it to fall below its proper level,—this gives the *contra, puerility*. Certain figures are proper in poetry which would ill become prose; they should always be consistent.

The 2d respects the choice of objects: these should exactly accord with the nature of the thoughts; to instance an extremely natural, familiar, and consistent metaphor, used by *Otway*, in his *Caius Marius*, where *Metellus* compares *Sulpitius* to a bull.

“ That mad wild bull, whom *Marius* lets loose
 “ On each occasion, when he'd make Rome for him
 “ To toss our laws and liberties i' th' air !”

3dly. A metaphor should be founded on a clear and perspicuous resemblance; should not be too far fetched, but easily recognisable. A continued metaphor becomes an *Allegory*.

4thly. Great care must be taken to preserve the language of metaphors free and clear from that of common expressions; never to construct a period so that part may be taken metaphorically and part literally.

5thly. Care must also be taken not to suffer two metaphors to meet upon the same subject, in the same period. This is an error which writers of a lively imagination and rich conception are most likely to fall into. A variety of instances could be produced from great and even correct writers of this excess.

6thly. Metaphors should not be crowded together on the same object, although distinct; such profusion produceth confusion in the mind of a reader.

7thly. A metaphor should not be too far pursued. This is what is called running down a metaphor. This straining of metaphors indicates a want of delicacy.

Allegory is a continued metaphor, and consists of the representation of one thing, passion or action, by another which has a resemblance to it. The preceding directions given for the construction of metaphors also relate to allegories, from their affinity: the only material difference, besides that the one is short and the other long, is, that a metaphor always explains itself by the words that are connected with it, in their proper and natural manner. Should we say, “ Achilles was a lion,” “ An able minister is the ‘‘ pillar of a state;” here the lion and pillar are sufficiently explained by the previous nomination of Achilles and the minister. A metaphor must be thus close; but an

allegory may be less connected with the literal meaning, its interpretation being not so plainly pointed out, but left to the reader's reflection.

Hyperbole,—consists in magnifying an object beyond its proper bounds. It is extremely common to most languages, intruding itself into common complimentary conversations, which from use are not so considered. It is an extremely beautiful figure, when properly applied. Thus Milton's description of the despair of Satan, is assuredly natural, and beautifully given :

“ Me miserable ! which way shall I fly ?
 “ Infinite wrath, and infinite despair.
 “ Which way I fly is hell, myself am hell ;—
 “ And in the lowest deep, a lower deep
 “ Still threatening to devour me, opens wide,
 “ To which the hell I suffer seems a heaven.”

Hyperboles should never be employed in simple description, and even where admitted, most carefully. In an earthquake, or some great convulsion of nature, they may be properly used ; but if employed on common occasions, they become mere bombast. Good sense, and an accurate taste, are essential to ascertain their limit and application.

Personification lies entirely in the thought, where words are taken in their common and literal sense. A forcible personification is made by representing inanimate objects as vitally existing. It becomes a strong species of metaphor. All poetry is much indebted to it : nor is it excluded from prose. Common conversation is not without it : the earth *thirsting* for rain ; the fields when they *smile* ; ambition *restless*, and disease *deceitful*, are all personified figures. There are *three* different degrees of this figure : the first, when some of the properties of living creatures are ascribed to inanimate objects ; the second, when these inanimate objects are described as acting like such as have life ; and the third, when they are described as either listening or speaking to us. The first and lowest degree is familiar to common conversation ; the second and third are of a higher ascent, termed *Prosopopœia*. In poetry, personification of this description is remarkably frequent. It constitutes its nature ; Milton and Shakspeare, are full, and Homer, the father of Greek poetry, is indeed superlatively *béautiful* in personification.

The third, last, and highest degree, is when inanimate objects are represented not only as feeling, acting, &c. but also speaking to us. This is the boldest of all rhetorical figures, and properly denotes the impassioned state of the mind. Milton's specimen of the address of *Eve*¹ to Para-

dise, on being compelled to leave it, is well known,¹ and as fine an instance as can be given. In the management of this sort of personification, two rules are essential for its observance: first, never to attempt it unless prompted by strong passion,—and never to continue it when the passion begins to subside. Secondly, never to personify an object which has not dignity in *itself*, or that is incapable to make a proper figure in its newly raised elevation.

Apostrophe is an address to a person who is either absent or dead, as if really present, and attentive to us. This figure, in boldness, is a degree below the last order of personification. This description may here suffice.

Comparison, or *Simile*, is when the resemblance between two objects is expressed in form, and pursued more fully than metaphors will admit:—for instance, “The acts of “princes are like those great rivers, the course of which “every one beholds; but their springs have been seen by “few.” This may serve to evince the general nature, at the time it shows us that a fortunate comparison is a sparkling ornament, adding lustre and brilliancy to language.

All comparisons are reducible to two heads; *explanatory* and *embellishing* comparisons. They are given with a view to render the objects more clear, pleasing, and engaging. Even abstract reasoning admits them. Embellishing comparisons add the most superlative beauty to language.

Antithesis exists in contrast, or opposition of objects themselves, or of sense to sound, or *vice versa*; which last is denominated verbal antithesis. Antithesis may be often employed to noble purposes; and in judicious hands, nothing tends more to illustrate or afford conviction. Its too frequent use, however, and when the words employed are new and quaint, renders a style unpleasing, and savours of puerility.

Interrogation and *Exclamation* are passionate figures. The literal use of interrogation is the asking of questions, whilst that of exclamation imparts surprise, wonder, or astonishment. The first figure is extremely useful in embellishing and illustrating theological and philosophical discourses. Interrogations are often employed in close connected reasoning. Exclamation belongs only to the most interesting and passionate situations.

Vision is a figure employed only in highly animated composition; it is a description of past or future events, as now at *this moment* passing before our eyes: vide, for the latter instance, that beautiful passage in *Ezekiel*, viii. 14.

Climax consists in the arrangement of a subject, and is the bringing its most interesting parts to a final close.

In Rhetoric, it also consists in an artful exaggeration of all the circumstances of some object, or event, heightening one above another, until our ideas are raised to the highest pitch possible, all increasing in their interest. *Climax* appears too regular to be considered as the language of passion; it properly belongs to that class only, where pre-meditated study is admitted.

Metonymy, is when one thing or name is put for another.

Irony, is used in sneering or contemptuous expression.

Synecdoche, when a whole is expressed by a part, or *vice versa*.

Catachresis, occurs when a new, bold, or improper name is used for the literal or proper one.

There are a great variety of other figures, which will not admit of description here, for want of room,—or with the following we describe for the same reason.

Conduct of a Discourse or Theme in all its Parts—Consists of six, i. e. *Exordium*, or introduction; the chief end of which is to conciliate the good opinion of the auditors, to excite proper attention, and render them open to conviction. Its characteristics consist of conciseness, modesty, and delicacy. *Enunciation*, *proportion*, or *division*: this should be distinguished by being clear and distinct; and that the parts into which the discourse is to be proportioned be really distinct from each other, and will naturally admit that disposition to be made; the order of nature must be implicitly followed; the members of a division should exhaust the subject, or the division is incomplete. Conciseness should be most scrupulously adhered to; and unnecessary multiplication avoided. *Narration* and *Explication* are joined, because governed by nearly the same rules, and generally answer the same purpose. Attention to clearness, distinctness, probability, and to be concise, are qualities which cannot be dispensed with. Explication in the pulpit, answers the place of narration at the bar: its style correct and elegant. *Argument*, the first requisite in which is invention; the second, disposition, a clear manner, and an elegant style. They should not be extended too far, or confused one with another; should be convincing and logically correct. Should the subject admit the *Pathetic*, it should be indulged in; but if good sense be its feature, logical correctness, carrying conviction in its nature, should, in preference, be attended to. *Peroration*, *recapitulation*, or *conclusion*. A discourse assumes either of those characters, according to its nature: sometimes a brief recapitulation of the chief events mentioned in the discourse, bringing to a final point the objects of the orator, may be alone necessary; at

others it ends best with the pathetic part of a *discourse*.—
See *Blair*.

LOGIC.

Definition.—*Logic* is a science which directs us in the pursuit of truth; pointing out the proper mode to discriminate between truth and falsehood, however specious the appearance of the latter. It leads us through the labyrinth of error to rectitude of conception, or its definition would be correct, should we say—It is the history of the human mind, it traces the progress of knowledge from the most simple of conceptions through every different combination and their numerous deductions, the result of various comparisons, one with another. The precise business of Logic is to explain the nature of the human mind, the proper manner of conducting its several powers, to attain truth and knowledge. It exposes those errors we are, through inattention, liable to run into; teaches us to discriminate between *verity*, and what wears its appearance only. By which means, we become acquainted with the nature of the understanding, see what lies within its reach, where we may attain certainty, and also where we must be content with probability. The science is divided into four parts, *perception*, *judgment*, *reasoning*, and *method*, which we shall briefly touch upon presently.

Its Origin.—It is a science which emanated from that wonder of human nature,—was produced by the most consummate philosophical genius, which has yet been manifested, ARISTOTLE. His ingenious mind conceived, and his astonishing systematic capacity perfected it, about 2163 years ago. According to the simplicity of that age, his system was very brief, consisting of a *prænium*, or introduction, and three chapters only: the 1st, on *simple apprehension*; or perception; 2d, on *complex perception*, propositions, and simple judgment; and the 3d, on *syllogistic arrangement* and discussion: with some conclusive observations on the use of logic. This science was subsequently enlarged, and we suppose improved upon, by numerous hands, in various periods, between that time and the present.

PART I. — PERCEPTION.—As we are on every side surrounded by an immense variety of objects which make various impressions, and also operate differently upon our sensitive nature; consequently they convey a variety of impressions, called *perceptions* to the mind, and at the same time awaken the powers of the understanding.

By reflecting upon these sensations, we become sensible

of their operation on our minds, and attend to them as to a new set of exterior acquaintance; these, if not quite so acute as present perceptions, are more accurately circumstantial. In this process, however, there are only barely *perceptive powers*, employed in exciting simple consciousness. The mind, without proceeding farther, takes cognizance of the impressions by which it is affected, reviews the objects in the order they were presented, one after another. This attention of the understanding to its store of impressions, is called by logicians, in contradistinction to simple perception on *first impression*, *a review of simple and complex perceptions*, which previous notices have settled in the mind one after another, in the order they were received by the sensitive faculties; and are become the materials for thinking, and the improvement of our knowledge, being as yet but mere *perceptions only*.¹

It is not until after they have obtained existence in the mind, so as to be summoned up to a review, that they are entitled to the distinguished appellation of IDEAS.

It may now become necessary that the mind so furnished with perceptive pictures, or ideas, should communicate its mental representations to others. How is this to be done? — The God of nature has formed man for a social creature, given him speech as a common faculty of his existence, which qualifies the species for mutual and reciprocal communication, and which enables him to clothe his ideas with words, which stand for their *names*. Now these names having been long since agreed upon, whenever they are pronounced, the pictures of the ideas for which they stand, are immediately made visible to a second person, to whom the verbal communication is given. Our ideas and their previous perceptions are seldom of such pure substances as to be called properly and logically *simple*: but, as they, for the most part, are made up of various compounded substances, so ideas *representing these substances* are called *complex ideas*.

As complex ideas are more general than pure or simple ideas, so are they much more easily named, and more readily conceived by others.

Should a novel invention, or discovery, be required to be defined, it will be made more readily apparent to others, if we observe that it partakes of such and such appearance or property in certain objects already known.

A DEFINITION is said to be "*The unfolding of some*

¹ Vide "Helvetius on Man," "Bell's Essay on the Construction of Prose," vol. ii. and "Lord Kaine's Elements."

“conception of the mind, answering to the word or term “made use of as its sign.” In exhibiting any idea to another, it is requisite that the description be such, as may excite the precise idea in his mind: hence it will appear that neither definitions, nor original names are, as have been supposed, merely arbitrary, or dependent on the will of the persons making use of them, no more than was original nomination; that depending upon certain known and prominent qualities in the objects; though certain logicians, from their ignorance of etymology, could not discover why gold was so named, they thought it might in the first have been as well called silver. But there are sufficiently obvious reasons for every name given to all objects in nature, which etymology, with a knowledge of eastern languages, can unfold.²

The reason is sufficiently apparent why it is easier to define complex ideas, than simple notions; because there are a large variety of objects, and sufficiently well known, which the subject required to be defined may resemble. Therefore it is only to specify those traits of resemblance in other objects, the connexion of such representative features, and other prominent peculiarities in the object to be defined, to fix, from one of these causes, or else from its apparent purpose, a nominal appellative, and to impress it on the mind of the person to whom communication is made: the object desired is then obtained.

In definitions there are two principal rules to be observed; first, to enumerate the various names of the specific ideas employed; next, to fix the definite species of connexion, and to render its manner sufficiently apparent.

Great precaution is also requisite to be sufficiently explanatory, and to say no more than is necessary in definitions:—to obtain this, *first*, take the most correct view

² The name of the sun in the Egyptian primitive tongue was OR, which also signified *light*, (Plutarch); the Hebrew name AUR, is *light*; Chaldaic UR, *fire*; the Greek ἀέρ, is the *air*, often *light*; the Latin, from the Æolic Greek, AURA, is the *air*; the Irish from the Pœni Celtic or Carthagian, ultimately Phœnician, is AER; from the same origin came the Greek word ἥρις, and the English *fire*; in Hebrew, OR, implies *to arise*, or *lift oneself up*, or *to be raised*, whence the Greek ὅρις, *to raise*, *excite*; and the Latin *orior*, *to arise*; whence also *oriens*, *the east*, and English *orient*, *oriental*; also Latin, *origo*, and English *origin*, *original*, *originate*. But gold derived its name from the colour and name of the chief planet, the SUN, of which it is a type: by its ancient name this metal is still known to the modern French, from the ancient Gaelic. Whilst silver comes from the Latin name *Luna*, being also a type of the Moon, whose name is chymically recognised in the name of this metal. Hence the two chief and most valuable metals are named from the two primary planets: and it is also equally easy to trace other metallic names, and to recognise their chymical nature by the same analogy,—their similitude of colour.

of the object to be defined, trace it to its original principles, and mark the several simple perceptions which enter into its composition. *Secondly*, we should consider the particular manner in which these elementary ideas are combined, to form that precise conception for which the term we use, is meant to stand. This done, we have then fairly to transcribe the appearance it makes to our own minds. Such description, by distinctly exhibiting the order and number of primitive conceptions, cannot fail to excite in the mind of every one, the whole complex idea resulting from them; therefore, by these means, we attain the proper end of a correct definition.

Composition and Resolution of our Ideas, with Rules for Definition thence arising.—The preceding rule is general, and extends to *every* possible case where doubt or difficulty can arise. As it may not be necessary to practise it in every instance; for many of our ideas are very complicated, insomuch so, that it would be difficult to enumerate the simple perceptions which give them being, then, to obviate this, certain compendious rules of defining are agreed upon between logicians, which will now be mentioned. There is a certain gradation in the composition of all our ideas. The human mind is very limited in its views, cannot embrace a large number of objects at once, but must proceed gradually, and make its acquisition subservient to the succeeding superstructure. In forming complex notions it makes use of a few simple ideas, such as may be managed with ease, which it unites into one conception.

This fund of simple conceptions, are rendered familiar by habit, and in their turn also become component parts of other ideas, still more complicated. In a series of this kind, should we be desirous to arrive at the last and highest order, it will be expedient to proceed gradually through the whole chain of intermediate ideas. For were an idea to be rudely broken in pieces, the number of parts which may possibly compose it, would confound us with amazement! Therefore, to proceed with certainty, it were best to adopt the graduated process now given.

All ideas we receive from the objects of nature which surround us and furnish impressions of distinct individuals; when compounded together in certain particulars they resemble each other; collecting these resemblances, the compound idea which results, furnisheth us with the idea of a *species*. This idea is less complicated, for it includes various peculiarities. Again, by comparing several species together, we obtain the idea of a *genus*. And which, lessened in the same manner, brings us by degrees to the contemplation

of the most elevated of conceptions, it brings us up to the conception of what is denominated **BEING**, where only the bare idea of *existence* is concerned.

The preceding is the mode by which the mind ascends; it is the most congenial order to humanity, and is denominated the **SYNTHETIC**. The **ANALYTIC** is opposed to it, which is more properly appertaining to the **DEITY**, who views all effects through their causes, and comprehends *all*, without that aid which his creatures are compelled to resort to, to arrive at probable certainty.

Thus the order is marked by which the mind ascends, which is reversed should it be required to follow the opposite course. For we have then to superadd the idea of the species to the genus, and in all inferior species to add the specific difference to the nearest species, till we come to individual existence. In all which specific definitions, should be carefully noticed.

PART II.—Of JUDGMENT.—The mind being furnished with ideas, the next step to knowledge is, by comparing them, to discover their agreement or disagreement. In this joint view, if the relation be such as enables the mind instantly to discover, on bare inspection, the judgment is then called *intuitive*. Thus, that *the WHOLE is greater than a PART*, is an intuitive judgment; nothing more being required than attention to the ideas *whole* and *part*.

But to judge of *facts*, the aid of *experience* and *testimony* is required. These things cannot be judged of by the bare contemplation of ideas: it does not follow, because I may have the idea of any monstrous object in my mind, that such should exist in nature, therefore the aid of experience is essential to convince me that there is, or is not, such an object in existence.

The foundations of human judgment, and from whence all certainty in it proceeds, are derived from *three* sources: first, *intuition*, with respect to *ideas themselves*, and their relations, which supports that species of reasoning, called *demonstration*; for what is deduced from intuitive perceptions, in a clear and connected series, produces absolute certainty. The second ground is *experience*: whence existence is inferred. This has chiefly relation to sensual perception. As there are many facts which will not admit of an appeal to the senses;—in this case the third ground appears, which is founded upon *testimony*. This is discovered to have relation chiefly to historical knowledge: where events are described, of which we cannot possibly come to a true conception, (they relating to transactions long past into the chaos of time,) but from the authorities of those who had

the best opportunity to arrive at the truth of the circumstances they describe; in all such cases, we should be convinced of the capability and credibility of those who make the relation.

Of affirmative and negative Propositions.—As the comparing of our ideas constitute *judgment*, when our judgments are put into words, they bear the name of *propositions*. A proposition, therefore, affirms the agreement, or else negatives the concord of some ideas in the mind. Our judgments include, at least, two ideas, one of which is affirmed or denied of the other, so must a proposition have terms answering to these ideas. The idea of which we affirm or of what we deny, the term expressing that idea, is called the *subject* of the proposition; whilst the term, *by* which we affirm or deny, is called the *predicate* of the proposition. Thus in the assertion that *God is omnipotent*, the term *God* is the *subject*, and *omnipotent* the *predicate*. But it is not sufficient to have terms thus expressive of our ideas; unless we have words to express the agreement or disagreement. The word connecting the subject and predicate is called the *copula*; accordingly, the verb *is* was the copula to the above. Thus we see that all propositions have *three* parts. When the mind joins two ideas, it is called an *affirmative*, as in the above instance: and when it separates, it is called a *negative*; which negative is generally expressed by a simple particle, as—“*No man is perfect.*” In the sentence, “*The man who departs not from an upright behaviour, is beloved of God,*” is evidently affirmed of the subject, an *upright man*, so that, notwithstanding the negative particle, the proposition is still affirmed. The reason is plain, because the negation affects not the copula; but, making properly a part of the subject, serves with other terms in the sentence to form one complex idea, of which the predicate, *beloved of God*, is affirmed.

Of universal and particular Propositions.—Our ideas, from what has appeared, when they enter the mind, are all *particular*,² and it is by *abstraction* alone, we can render them *general* or *universal*, which infers our conception of an entire class; and sometimes, indeed, a *genus* or entire classes. If we suppose any general term be the subject, it is evident, that whatever be affirmed of the abstract idea, extends to its individuals; thus, when we say *men are mortal*, we consider mortality not as confined to one, or any particular number; but as extending to the whole aggregate. It should be observed of general terms, which often enter a

² Vide “*Helvetius on Man.*”

proposition, that they sometimes appear with a mark of limitation; when we are given to understand that the predicate agrees not to the whole, but only to a part; as, *some men are wise*. Here wisdom is not affirmed of every particular man, but is limited by the very subject; restraining wisdom to a few of the species.

Propositions are universal where the subject is so, without a mark of limitation. On the contrary, propositions are particular, where some universal subject appears, with a mark of limitation. Sometimes there are also singular propositions contained under the head of particular.

Seeing that all propositions are either *affirmative* or *negative*; nor is it less evident that in both cases they may be *universal* or *particular*. Hence arises that celebrated four-fold division of them into *universal affirmative* and *universal negative*, *particular affirmative* and *particular negative*, which comprehends, indeed, all their varieties. The utility of thus distinguishing them, will appear, when we treat of reasoning and syllogisms. There are also *absolute* and *conditional* propositions. As all mundane concerns are liable to change, what we affirm at one time, cannot, perhaps, hold good at another. Yet, amidst the vicissitudes of nature, there are some things which remain constant; whilst others are perpetually changing: some governed by uniform and steady laws, which, when known, direct our judgment respecting them. Hence, it follows, that to express ourselves with precision, propositions must be formed suitable to these several circumstances. Hence, also, there obtains a considerable diversity in our manner of judging, which gives rise to propositions of this nature. The attention to these propositions is of the greatest importance to philosophy, inasmuch as a due attention to them will teach circumspection in affirming things absolutely; but where they are inseparably conjoined. If in our judgments we distinctly mark the conditions which determine the predicate to belong to the subject, we shall be less liable to mistake in the application of general truths to particular concerns of human life. Hence the peculiar felicity of mathematical knowledge, that what mathematicians demonstrate of magnitude in general, may be with ease applied in all obvious circumstances.

Particular propositions are known to be true when we can trace their connexion with universals. The great business of science appears to be, to discover general truths that may be applied with safety in all obvious instances. The advantage arising from accurate determination, is, that thereby particular propositions really become universal, and may be introduced with certainty into reasonings, and serve

as standards to conduct and regulate our judgment. To illustrate,—if we say, *Swift water acts very forcibly*, the proposition is particular; as the condition, on which the forcible action depends, is not specified, it is yet uncertain in what cases it may be applied. Let conditions be supplied, and it will stand thus: *Water, conveyed in sufficient quantity along a steep descent, acts very forcibly*. Here we have an universal judgment, inasmuch as the predicate *forcible action* may be ascribed to *all* water, under similar circumstances.

Of simple and compound Propositions.—Hitherto simple and compound propositions, where only *two ideas* are compared together, have been spoken of; it now remains to notice, that propositions are also divided into simple and compound; that compound propositions are either *copulative* or *disjunctive*. Propositions are also divided into self-evident and demonstrable: self-evident truths are, as have been partly seen, the first principles of reasoning. As it is certain, if in our researches we employ only such principles, and apply them according to rule, afterwards to be adduced, we shall be in no danger of error in advancing from one subject to another. To prove this, let us advert to the writings and reasonings of mathematicians, which being conducted on this express plan, afford incontestible proof of the stability of human knowledge, when so constructed. The propositions of science have stood the test of ages, and are still attended with that invincible evidence that forces the assent of all who duly consider the proofs on which they are established. Definitions are of great help to clearness and evidence in knowledge: mathematicians, by beginning with them, procure a ready reception to truth. The establishment of principles is the second step in mathematical knowledge. Propositions are divided into speculative and practical: hence mathematical principles are distinguished into *axioms* and *postulates*. Whilst demonstrable propositions are distinguished into *theorems* and *problems*. *Corollaries* are obvious deductions from theorems and problems.

PART III.—Of REASONING.—It often happens in comparing ideas together, that their agreement or disagreement cannot be discerned on a first view; whence the necessity of having recourse to a third, or medium idea, that will admit of such application as the particular case requires; if we succeed here, all difficulties vanish. Thus right-lined figures are all reduced to squares, by which means their areas may be ascertained, and their agreement or disagreement, in point of magnitude, settled with facility. This nature of arriving at truth is termed **REASONING**. Hence it appears, that every act of reasoning necessarily includes three distinct

judgments: two wherein the ideas, whose relation we want to discover, are severally compared with the middle idea; and a third, wherein they are themselves connected or disjoined, according to the result of that comparison. Now, as in the second part of logic, our judgments, when put in words, are called prepositions, so here, in the third part, the expressions of our reasonings are termed *syllogisms*. It also follows, that every act of reasoning implies three several judgments; so every syllogism must include three propositions. When a reasoning is thus put into words, and appears in form of a syllogism, the intermediate idea made use of, to discover agreement or disagreement, is called the *middle term*, and the two ideas themselves, with which this term is compared, take the name of extremes.

However, as it is impossible to illustrate without examples, let us inquire *whether men are accountable for their actions*. The relation between the ideas of *men* and *accountableness* comes not within the immediate view of the mind; a third idea must be found, which will enable us to discover and trace it. A little reflection informs us, that no creature can be accountable for actions, without we suppose him capable of distinguishing between good and bad; in other words, unless we suppose him possessed of *reason*. This alone is insufficient. For what would it avail him to know good from bad actions, if he had no freedom of choice; nor could avoid the one, and pursue the other? Hence it becomes necessary to take in both considerations in the present case. It is, at the same time, equally apparent, that whoever takes in this ability of distinguishing good from bad actions, and the *liberty* of pursuing the one and avoiding the other, there it is implied also, that a creature is *accountable*. We have now got a third idea, with which *accountableness* is inseparably connected, i. e. *reason* and *liberty*; which are here considered as making up the conception.

Let us now take up this middle idea, and compare it with the other term in question, i. e. *man*, and we know by experience that it may be affirmed of him. Having thus, by means of the intermediate idea, formed two judgments, viz. that *man is possessed of reason and liberty*; and that *reason and liberty imply accountableness*; a third obviously and necessarily follows, i. e. that *man is accountable for his actions*. Here then is a complete act of reasoning, in which, according to what has been already observed, there are three distinct judgments; two that may be styled previous, inasmuch as they lead to the other, and arise from comparing the middle idea with the extremes: the third is a consequence of these previous acts, and flows from combining

the extreme ideas between themselves. If we now put this reasoning into words, it appears in the following syllogistic form:

“ Every creature possessed of reason and liberty is accountable for his actions:

“ Man is a creature possessed of reason and liberty:

“ Therefore man is accountable for his actions.”

Here there are three several propositions, expressive of three judgments implied in this act of reasoning, and so disposed as to represent distinctly what passes within the mind in tracing the most distant ideas. The two first answer to the previous judgments, and are termed *premises*, because they are placed before the other. The third is termed the *conclusion*, as being gained in consequence of the previous assertions. We should also remember, that the terms expressing the two ideas, whose relations we inquired after, are *man* and *accountableness*, these are *extremes*; the intermediate idea, of *a creature possessed of reason and liberty*, has also the name of *middle term*. Hence, it follows, that by the *premises* of a syllogism, we are always to understand the two propositions, where the middle term is severally compared with the *extremes*; these constituting the previous judgments, whence the truth we are in quest of, is by reasoning deduced. The *conclusion* is the other proposition, in or by which these extremes are joined or separated agreeably to what appears on comparison. The conclusion is made up of the extreme terms of the syllogism, *which serve as the predicate* of the conclusion, and goes, also, by the name of the *major term*; the other extreme makes the *subject*, and is called the *minor term*. Thence arises another distinction between the premises, when such extremes are severally compared with the middle term. That proposition which compares the predicate with the middle term, is called the *major*; the other, where the *middle term* is compared with the *subject* of the conclusion, is called the *minor*. All this is sufficiently obvious from the preceding example.

It should be noticed, that in a single act of reasoning the premises must be intuitive truths; of which reasoning in the highest exercise is only a concentration of syllogisms, which requires intuitive certainty in every step of the progression.

Of the several Kinds of Reasoning, and first of that by which GENERA and SPECIES is known.—All the aims of human reason may generally be reduced to two: 1st, to rank things under the universal idea to which they belong; and, 2d, to ascribe to them their several attributes and properties, in consequence of that distribution. In this, the *first* kind

relates to *genera* and *species*. It being quite plain that we cannot ascribe a property to any genera or species, until we have ascertained whether the distinction applied relate to such generic or specific character. Hence reasoning begins with referring things to the several divisions or classes, to which they appertain in the sphere of our ideas, which divisions are distinguished by names. To arrive at satisfactory conclusions, we should first take a view of the idea denoted, by its general name,—carefully attend to such distinctions which characterize it.—2d. Compare the idea with the object,—observe where they agree or differ. Those steps should be always followed, though in familiar cases we do not always attend to them. Notwithstanding that, the importance of this branch of reasoning is of the greatest moment. Its exact observance is practised by mathematicians. It may be observed, that fixed and invariable ideas with steady application of names, renders this part of knowledge both easy and certain.

Of Reasoning as it regards Powers and Properties of THINGS, and the Relations of our general IDEAS.—We have now arrived at the second great end which men have in view in their reasonings, *i. e.* the discovering and ascribing to things their several attributes and properties. Here it will be necessary to distinguish between reasoning, as it regards the sciences, and as it relates to affairs of common life. In the sciences our reason is employed about the establishment of universal truths, as by them the bounds of human knowledge are enlarged: hence the division of things into classes, called *genera* and *species*. For universal ideas being used as representatives of many particulars, whatever is affirmed of them may be affirmed of all individuals to which they belong. The application of some general truth to any obvious instance constitutes the reasons applicable to common life. Men, in the most ordinary transactions with each other, have for the most part to do only with common objects: hence, that as reasoning regards common life, is no more than ascribing the general premises to the several objects which immediately concern the class to which it belongs. First, we refer the object to some general idea; and, lastly, ascribe all those attributes to the present object.

Thus, in considering character, that of *Sempronius* for instance, is discovered to be of the kind called *virtuous*. We then reflect that this description of character is worthy of esteem; it naturally and obviously follows that *Sempronius* is so too. Those thoughts put into syllogism appear as follow:

“ Every virtuous man is worthy of esteem:

“ *Sempronius* is a virtuous man:

“ Therefore, *Sempronius* is worthy of esteem.”

The reasoning applying to this syllogism being but slightly varied from the former, to which the reader is referred.

But, that our thoughts should be directed with order and method, *i. e.* as we should observe of the necessary qualifications essential to the constituting a good reasoner: they appear to be two; 1st, *To observe such relations which immediately discover themselves, on comparing ideas one with another;* and 2d, *Such, which being more remote and distant, and which require art and address to bring them into view.*

Relations of the first class furnish *self-evident truths*; those of the second are discovered by reasoning and a due application of intermediate ideas. It is of this last kind we have now to speak; therefore, in tracing the distant relations of things, we must have recourse to intervening ideas, and are more or less successful in our researches, according to our acquaintance with those ideas and our ability of applying them. It is evidently necessary for a good reasoner to possess the two following qualifications: 1st, an extensive knowledge of those intermediate ideas, by means of which things may be compared one with another: 2d, the skill and talent of applying them properly in all particular instances, which come under consideration.

In order to be successful in reasoning, an extensive knowledge of all those intermediate ideas are highly essential, by which we compare things one with another: for it is not every idea that will answer the purpose of our inquiries, but such only as are peculiarly related to the subject about which we reason; so as by comparison with them to furnish evident and known truths. Nothing can be more apparent than that the greater number of conceptions we can call into view, the more likely we are to find *some* among them, that will help us to the truths we want. And, indeed, it is found to hold in experience, that in proportion as we enlarge our views of things, and grow acquainted with a multitude of different objects, the reasoning faculty gathers strength; for, by extending the sphere of our knowledge, the mind acquires a greater force and more accurate penetration, from being accustomed to examine a large number of appearances of its own ideas, and observe what light they cast one upon another.

This is the reason, why in order to excel remarkably in any *one* branch of learning, it is necessary to have at least a general acquaintance with the whole circle of arts and

sciences; for the obvious reason that all branches of human knowledge are very closely connected, and in innumerable instances serve to illustrate each other. Should our entire views be directed to one branch alone, we might, perhaps, excel in that, but with respect to general subjects, our prospects must be extended. Besides, a general knowledge is a good preparative, and enables us to proceed with ease and expedition in any branch of learning we endeavour to obtain; but then in the minute and intricate branches of any science, we are not qualified until we have mastered the science to which they belong.

Secondly, much skill is required in applying those intermediate ideas happily, as might be shown in a great variety of instances. Here, however, rules and examples are but of little utility, because it will readily occur, that as the instances are so various and equally dissimilar, with circumstances requiring this exercise, good sense and experience will supply the best precepts. However, the study of mathematical demonstrations will prove of great avail, also of such authors who are remarkable for strength and justness of reasoning.

PART IV. — *Of the Form of SYLLOGISMS.* — Hitherto we have been confined to general notions of syllogisms and of its parts; we now examine its various forms. In what has preceded, the *major* and *minor* propositions and *middle term* have been chiefly considered; but it often happens that the *middle term* is the subject of the *major* proposition, and the predicate of the *minor*. This disposition, though the most natural and obvious, is not, however, at all times necessary; it frequently happening, that the middle term is the subject of both premises, or the predicate in both, and sometimes directly contrary to the disposition which has preceded: hence the distinction of syllogisms into various kinds, called *figures*. For instance, figure, according to the use of the word, signifies nothing but the order and disposition of the middle term in syllogisms. Of this disposition we see fourfold, so the figures of syllogism are four in number. When the middle term is the subject of the major proposition, and the predicate of the minor, we have the *first figure*: as,

“ No work of God is bad :

“ The natural passions and appetites of men are the work of God :

“ Therefore none of them *are* bad.”

On the other hand, when it is the predicate of both the premises, the syllogism is of the *second figure*: as,

“ Whatever is bad is not the work of God :

“ All the natural passions and appetites of men are the work of God :

“ Therefore the natural passions and appetites of men are not bad.”

Again, in the *third figure*, the middle term is the subject of both premises : as,

“ All Africans are black :

“ All Africans are men :

“ Therefore some men are black.”

Lastly, by making it the predicate of the major and the subject of the minor, we obtain syllogisms in the *fourth figure* : as,

“ The only BEING who ought to be worshipped is the Creator and Governor of the world :

“ The Creator and Governor of the world is God :

“ Therefore God is the only BEING who ought to be worshipped.”

But, besides this fourfold distinction of syllogisms, there is also a farther subdivision of them in every figure, arising from *quantity* and *quality*, as they are called, of the propositions. By *quantity*, we mean the consideration of propositions, as universal or particular ; by *quality*, as affirmative or negative.

Now as, in all the several dispositions of the middle term, the propositions of which a syllogism consists, may be either universal or particular, affirmative or negative ; the due determination of these, and so putting them together as the laws of argument require, constitute what is called by logicians, the *moods* of syllogism. Of these moods, there is a determinate number to every figure, including all possible ways in which propositions differing in quantity or quality can be contained, according to any disposition of the middle term, in order to arrive at just conclusions.

The first figure has only four legitimate moods. The major proposition in this figure may be universal, and the minor affirmative ; and it has this property, that it yields conclusions of all kinds, affirmative and negative, universal and particular.

The second figure has also four legitimate moods. The major proposition must be universal, and one of the premises must be negative, but all particular. These are all the figures which were admitted by the inventor of syllogisms ; and of which, so far as we know, the number of legitimate moods has been ascertained and demonstrated. For *every figure*, it will be found upon trial, there are *sixty-four* dif-

ferent moods of syllogism ; and he who thinks it worth while to construct so many in the *first* figure, always remembering that the *middle term* of each must be the *predicate* of the *major* and the subject of the *minor* proposition, will easily discern what number of these moods are *legitimate*, and give true conclusions.

Besides the rules which are proper to each figure, *Aristotle* has given some which are common to all, by which the legitimacy of syllogism may be tried. These are reduced to five : 1st. There must be only *three terms* in a syllogism : as every term occurs in two of the propositions, it must be precisely the *same* in *both*, if not, the syllogism is said to have four terms, which renders it *vicious*. 2d. The *middle term* must be taken *universally* in one of the premises. 3d. Both premises must *not be particular* propositions, nor both *negative*. 4th. The conclusion must be *particular*, if either of the premises be *particular* ; and *negative*, if either of the premises be *negative*. 5th. No term can be taken *universally* in the conclusion, if not taken *universally* in the *premises*.

For understanding the 2d and 5th of these rules, it is necessary to observe, that a term is said to be taken *universally*, not only when it is the subject of an *universal* proposition, but also when it is the *predicate* of a *negative* proposition. On the other hand, a term is said to be taken *particularly*, when it is neither the *subject* of a *particular*, nor the *predicate* of an *affirmative* proposition.

There are also various other divisions of syllogism, regulated according to mood and figure ; but as the preceding require the most notice, they shall suffice ; and we now proceed to

PART V.—INDUCTION, which is that portion of rational philosophy, of which the wonder and admiration of the ancient and modern world, the divine **SOCRATES**, made so admirable a use in the developement of moral truth, and thereby explained divine things. We commence by observing, that all reasoning ultimately proceeds from **FIRST TRUTHS**, either taken self-evidently, *i. e.* for granted ; and the first truths of all syllogistic reasonings are also *general* propositions. Except in mathematics and the sciences conversant about mere ideas, which have no immediate relation to things : without the mind, we cannot assume as truths propositions which are *general*. A mathematician, indeed, may be considered as taking his ideas from the beginning in their *general* form. Every *proposition* composed of such ideas is *general* ; and those which are theo-

retic are reducible to *two terms*,—a *predicate* and a *subject*, with a *copula* generally affirmative. If the agreement or the relation between the two terms is immediate and self-evident, he has recourse to an *axiom*, which is a proposition still more general, and which supplies him with a third or *middle term*. This he compares first with the *predicate*, and then with the *subject*, or *vice versa*. These two comparisons, when drawn out in form, make two propositions, which are called *premises*; and if they happen to be *immediate* and *self-evident*, the *conclusions*, consisting of the terms of the question proposed, are said to be demonstrated. This method of resolving is considered exactly according to the syllogistic form, as previously explained.

Sciences, which treat of things external to the mind, cannot assume general propositions as *first principles*, and from them infer others, till we descend to particulars, for this obvious reason: every thing in the universe, whether of mind or body, is first the object of sensitive conception in its individual state;³ so that *perception* and *judgment* are first employed in the investigation of its truth; of whatsoever nature we have first to encounter *particulars*; with these *reason* begins its operation. It tries, examines, and compares together; then judges by native evidence, as first presenting itself. Those native evidences, those indispensable inlets of knowledge, those innate evidences, are called the primary *principles of Truth*; from which, by **INDUCTION**, it ascends to general axioms. We might explain the progress of *Induction*, by *Physics*; but hoping we have made ourselves intelligible, we only observe that axioms so established are applicable to all parts of learning. The great logician, Lord **Bacon**, said of axioms founded upon **Induction**, that they may be called *the key to interpretation*. There is reason to believe, that **Induction** was a mode to arrive at truth invented *anterior* to syllogistic definition.

DEMONSTRATION, as has been observed, is most evident in *intuitive evidence*. It may, however, be attained by the previously stipulated means of syllogistic examination. To what has escaped on that head the reader is referred for the rules generally, by which it is regulated. It now alone remains to speak of the fourth and last division of **Logic**, which we shall despatch in a few lines.

PART VI. — METHOD.—The mind having prepared its fund of materials as previously directed, it has now to arrange them in such order, as may best suit its general purpose.

³ Vide *Helvetius* on *Man*.

The object of all argument being to produce conviction of some certain truths, it now becomes its duty, in conformity with this general view, so to dispose of its demonstrations, as best to suit the purpose for which it is solicitous. For which purpose we notice, that the logician's arguments should be arranged so as to let one rise above another in a progressive series; each being more cogent, strong, and convincing than what has preceded, until he arrives at the climax of all demonstrations — *self-evident, intuitive, or universal TRUTH.*

Conclusive Observations. — Although we do not propose to offer any new matter, yet as it has been usual to say something in commendation of this science, on its conclusion, we only follow the example of our predecessors, and observe, that if the science has not *Aristotle* for its primary inventor, every author since his time has considered him as the founder of syllogism; and from his treatise, previously noticed, and from *Organon* and *Porphyry's Introduction*, all subsequent writers have taken their materials.

Logic was assuredly much more encouraged during the period that school divinity was cultivated, than it has been since that epoch. Indeed, ever since the days of Lord *Verulam*, we understand that the practice of induction has been more generally adopted in this country than syllogistic inference; that great philosophical genius having impressed the public with a belief of its superior utility.

ALPHABETICAL WRITING.

As *Smyrna*, *Rhodes*, *Colophon*, *Salamis*, *Argos*, and *Athens*, all contended for the honour of the birth of Homer, a man, who, if report be true, whilst living, neither would supply with bread, but suffered that more than human genius to be a mere Πελασγι, or wanderer, who, it is said, procured sustenance by singing or repeating his admirable hymns at the courts of princes and houses of opulent men, existing by means purely dependent upon eleemosynary donations;—so also did *Samaria*, *Phœnicia*, *Egypt*, *Greece*, *Arabia*, *India*, and *Syria*, contend for the honour of the origin of the useful art of *alphabetical writing* among them.

Inasmuch as the immortal labours of the poet justly claim precedence of all others, it will be seen that an art so intrinsically useful as that which now engages our attention, cannot be surpassed by any other ever employed by humanity for such useful purposes to which this is applicable.

From our having for many years directed our chief atten-

tion to *hieroglyphical writing*, and the records of antiquity connected therewith; the subject of our meditation has constantly recurred to the progress of man from his first essay, to record his conceptions; first by pictural writing, and next by the various modes of hieroglyphical record to which he had recourse, and which will be presently mentioned; whence we may be, perhaps, considered as the better qualified to discuss a question, having so intimate a connexion therewith.

It has been ascertained from various sources, but chiefly from the remains of architectural antiquity which have been at various periods discovered, that the site of the first seat of human civilized settlement, *ancient Babylon*, is what is now known as the vicinity of *Hella*, a town, or rather large village, situate on the Euphrates, distant about forty-eight miles from Bagdad. This once famous city, “*the glory of kings—doms, the seat of the Chaldee's excellency*,” has long since experienced the denunciation proclaimed by the prophet *Isaiah*, c. xiii. Its site, when visited by *St. Jerome*, in the 10th century of our era, was then used as a park, in which the monarchs of the district, *Parthia*, took the diversion of the chase. These ruins, once so famous, were then and are now so much destroyed, that the vigilant antiquary, the well-informed scholar, and the inquisitive traveller, can scarcely discover their mere vestiges, or even know the spot where they once stood. This so total a destruction of the immense monuments of human grandeur, it is confessed, appears beyond the natural effects of accidental demolition, its destruction having been produced as prophetic record proclaims, whereby we see effected the superhuman effects of Omnipotent justice against a place so eminently wicked; but when we consider those means, which the information of modern travellers furnish, the mystery of the circumstance yields to reason;—when we know that from those most superb structures, the immense ruins of which at one period covered an area of *eight times the extent of the metropolis of Britain*, numerous splendid cities of the east have derived an almost inexhaustible mine of materials for their erection, the fact is reconciled to reason. But in these ruins, in the time of *Herodotus*, 440 years before CHRIST, and even since, in that of *Diodorus the Sicilian*, forty-five years only before that era, there were discovered, in the walls of a temple, very large bricks, sculptured or impressed in the form of animals of various species, and painted to resemble life, with the colours burnt in, and then as brilliant as ever. This is the *first* essay to record transactions

and human conceptions in what is called *picture writing*. However, not to proceed without the best and most perfect authority in this assertion, an affair of much moment, we cite an observation of the learned and elegant Dr. *Blair*, to approve our information upon the origin of the *scriptural* art; who, in his essay on *Rhetoric*, &c. in the section appropriated to this theme, thus expresses himself: “ Thus to “ signify that one man had killed another, they *painted* the “ figure of a dead man lying on the ground, and of another “ man standing over him with a hostile weapon in his hand. “ When America was first discovered, this was the only “ mode of writing with which the *Mexicans*¹ were then ac- “ quainted.” This must be confessed to be very natural. *Second stage.* From analogy, we believe *Hieroglyphics*,² or *the shade of the sun traced on a level surface with a graver*, (called by *Clemens Alexandrinus* ιερογλυφαγραμματα,) was the next process towards record. Indeed, Dr. *Blair* proceeds, and vouches as much. This mode continued until it was found inadequate for the purpose; first, from the impossibility to express abstract thoughts by real representation; and next from its very cumbrous nature. In course of time, this was remedied by the *third stage*, which was what is denominated the *Symbolic*, made to represent invisible conceptions, on account of an analogy or resemblance between those ideas and the known properties of the substance pourtrayed. The ancients are presumed to have denominated the next process towards hieroglyphical perfection, being its *fourth degree*, the *Epistolic*, which consists of an union of the two former species. They had also a fifth kind, known as the *Hierogrammatic*. These first kinds of writing are said to have been used by the most primeval people in their rudest state, they using the two former kinds, many traces of which still remain in our Egyptian monuments. According to the progressive advancement of the human species towards perfection, they by degrees adopted those several kinds of writing, last respectively named, and in part described, to finish which description, now remains. The aboriginal species, there is room to suppose, was also denominated the *curiologic*, and the latter, the *tropical* hieroglyphic. We have said the latter kind was an improvement upon the former.

Those alterations in the mode of delineation, produced

¹ A colony originally emigrating from Carthage. Vide *Maurice* on *Babylon*; also *Plato's Atlantides*.

² In the opinion of many, the term is derived from ιερος, sacred, and γλυφω, to *carve in stone*, it having been the character used by the priests alone.

and perfected another kind of character, which we may be understood, when we denominate it *the running hand of Hieroglyphics*, or as Clemens Alexandrinus has it, *ιερογραμματα*, it being composed of the prominent and pre-eminent features of certain substances having a resemblance to the thing meant to be described, formed of the simple outline of the parts of those objects, and connecting many things together, as necessity might intimate were essential to perfect the idea, which writing bore a near affinity in representation to the *Chinese writing*. Thus the mode of original writing became much abbreviated: there is still a specimen of it remaining upon the famous *tri-scriptural* stone brought from *Rosetta*, now deposited in the *British Museum*. The first of which inscriptions consists of this kind of writing, and was addressed to the prejudices of the priests; the next is vernacular to *Ethiopia*,³ called **COPTIC**, from the city *Coptos*, on the *Euphrates*; and the third is in early **Greek** characters. It was an inscription made in the latter part of the *Lagydeean* dynasty, by the grateful inhabitants of Lower Egypt to *Ptolemy the Fifth*. This circumstance is just mentioned to show a specimen of what this kind of writing was; and also, further to exemplify the attachment of men to former customs and ancient habits; this appearing in the prejudice of the sacred order in Egypt, never to use any other character than what was sanctioned by the most remote customs; by this means, as the generality of men forgot it,—it was still used by the priesthood to clothe their proceedings with the veil of mystery, and to retain exclusively to themselves, all knowledge relative to matters of religion.

There appears little room for doubt that the preceding, or hieroglyphical mode of writing was perfected before the flood; which, with numerous arts and sciences, were preserved *in memory* by Noah and his offspring. Lest it may be objected that memory would have been insufficient for the purpose of retaining so great a fund of knowledge, it may be observed, that we have reason to believe, as the physical power of the antediluvians is known to be superior to those of their posterity subsequent to the flood, so it is submitted, we may rationally infer, that their mental faculties were also superior. Besides, it is known, that where retention is constantly exercised, the faculty acquires much greater strength in proportion to its use. Instances in infinite number might be adduced to prove this, were it thought necessary.

³ See the opinion of that very learned oriental scholar, Dr. *Adam Clarke*, upon this monument.

Also, there want not authors who allege that the antediluvians knew how to record events which have become susceptible of interpretation to postdiluvians, if we believe what *Origen* assures us, that certain books of *Enoch* were found in *Arabia Felix*, in the dominion of the Queen of *Saba*, which *Tertullian* affirms he saw, and read several pages of them; this he alleges in his *De Habiter Mulierum*, which books he places among the canonical; *St. Jerome* and *St. Augustine* look on them to be apocryphal. *William Postellus*, also pretended to compile his book *De Originibus*, from the book of *Enoch*; and *Thomas Bangius* likewise published at *Copenhagen*, in 1657, a work, which contains many singular relations of the mode of writing among the antediluvians.

It has, we know been asserted by the learned, that there were two columns erected, one of stone, and another of brick, on which Japheth had engraved the several sciences and arts with which the antediluvians were acquainted, and which are said to have been seen by the Jewish historian, *Josephus*, who alleged they were standing in his time; and from what has preceded, we may presume to state that the most ancient alphabetic characters known were derived from hieroglyphical representations. We take our assertion on the credit of the learned *Montfaucon*, that the ancient *Coptic* character,⁴ is derived immediately from the hieroglyphical figures. That author says, this character was retained in Egypt until the reduction of that country by *Alexander*; when the ancient letters fell into disuse, and a character formed by the substitution of the Grecian letters was received in its stead; but the twenty-four Greek characters being insufficient for that purpose, they introduced six of their own letters, making thirty-two, of which the alphabet consists.⁵

⁴ Vide a subsequent article, *Chronology*, where it will be seen that the invention of letters is ascribed to *Memnon the Egyptian*, 1832 years before Christ.

⁵ The Grecian language comes from the *Phœnician*, a dialect of the *Hebraic*. The following sixteen letters were first brought into the Greek alphabet by *CADMUS*,* the son of *Agenor*, a king of the *Phœnicians*; which Cadmus founded *Thebes*, in *Bœotia*, at a period cotemporary with *Joshua*:

Α Β Γ Δ Ε Ι Κ Λ Μ Ν Ο Π Ρ Σ Τ Υ.

On the authority of *Pliny*,* at or about the time of the Trojan war, *PALAMEDES*, also, the son of *Nauplius*, king of *Eubœa*, added the three aspirates, Θ, Φ, Χ, and the double consonant Ζ.

On the same authority, *SIMONIDES*, the philosopher and poet, also contributed to the alphabet, by adding four, Η, Ζ, Ψ, and Ω.

* *Literas seper arbitum Assyrias fuisse, sed alii apud Egyptios a Mercurio ut Gillius, alii apud Syros repertas volunt; utque in Græcum intrillisse e Phœnice Cadnum sedicim numero, quibus Trojano tullo Palmedium adjecisce quatuor hac figurâ Θ, Ζ, Φ, Χ, totidem post eum Simonidem mili cum Ζ, Η, Ψ, Ω, quarum omnium vis in nostris recognoscitur.*—*Plinii Nat. Hist. lib. vii. cap. 36.*

Notwithstanding what has just appeared, we do not mean to allege the *Coptic* to be the most ancient; this preference may be ascribed to the *Samaritan*, and perhaps is the original of that language. Be this as it may, there cannot, we think, exist a doubt, that the most ancient language now understood, is the one in which the oldest writings with which Europeans are acquainted, are written; these writings are evidently the **PENTATEUCH**, and the book of **JOB**, which language is known by name as *Samaritan*; and what the **Jews** now, and in latter ages have used, is the same that *Esdras* invented, or rather introduced, subsequent to the return of that people from captivity; in which, to the radical consonants, besides some few other alterations, were added fifteen vowel points; its original being the square *Chaldaic*.

Among others, the following arguments will prove that this tongue has the highest claim to primeval antiquity.

This language we submit to be original, for the following reasons: *First*, it is a language which does not appear to be susceptible of further improvement. *Secondly*, the *whole* letters of the alphabet are comprised in the two tables of the Mosaic law, except the **ו**, which, like the Greek **Θ**, may be perhaps unnecessary; on the receipt of which tables, the gift was accompanied with the words—“ **WHICH I HAVE WRITTEN**,” *Exod.* xxiv. 12. *Thirdly*, its radical words uniformly consist of two or three letters, and the derivatives branch out from them in a manner the best calculated to produce precision and correctness of expression.⁶ *Fourthly*, this question has undergone abundance of discussion, from the times of the first fathers of the Christian church to this day. *Origen* and *Jerome*, on the authority of the old **Rabbis**, speak very satisfactorily on the subject; this is *Origen*’s testimony:—“ In the more accurate copies of the Old Testament, the sacred name **JEHOVAH**, is actually written, but in the ancient Hebrew letters.” *St. Jerome* says, in his preface to the second book of *Kings*,—“ The **Samaritans** often copy the five books of *Moses* in the same number of letters that the **Jews** do; but these letters differ in form and the use of points. It is certain that *Esdras*, the scribe and a teacher of the law, after the taking of *Jerusalem*, and the restoration of the temple, under **Zerobabel**, invented those other letters which we now use; whereas, before that time, the letters of the **Samaritans** and the **Hebrews** were the same.” Respecting the expression of *Origen*,

⁶ Vide the article *Language*, for the conjugation of a Hebrew verb.

that the more accurate copies of the bible were written in his time in the Samaritan, we should observe, that neither Esdras, or the other Jewish rulers, thought themselves at liberty to alter the sacred name JEHOVAH, therefore it was continued as they received it.

One more observation is necessary before we quit the Hebrew or Samaritan claim: it appears that the book of *Job* also is supposed to be of an equal date with the *Pentateuch*, and it has been asserted that both are by the same author. Now *Job* thus expresses himself: “*Oh! that my words were now written! oh that they were printed in a book! that they were graven with an iron pen and lead in the rock for ever,*” xix. 23, 24; which expression, besides its evident import, admits of an inference that alphabetical writing was *then* well understood. That it was a customary thing to make records, we can perceive from his mode of expression; as it was to records so preserved that we owe the present only authentic and creditable history of India. Further, the respectable opinions of the very learned *Scaliger*, *Montfaucon*, *Chishult*, and *Dr. Sharpe*, goes to its confirmation.—*Vide Fry's Pentographia.*

The learned *Bochart* in his *Sacred Geography* proves it. See *Scaliger's Animadversion* on the *Chronicles of Eusebius*, and *Montfaucon's Palæographia Græca*.

The various known languages have the following letters: the modern Hebrew, 22, and 15 vowel points, answering in power to 37; the ancient Hebrew, Chaldee, Syriac, and Samaritan, 22 each; the Arabic, 28; the Persian, 31; the Turkish, 33; the Georgian, a species of Persian, 36; the Coptic, 32; the Muscovite, 43; the Greek, 24; Latin, 22; Sclavonic, 27; Dutch, 26; the Spanish, 27; the Italian, 20; the Ethiopic and Tartaric, 202 each; the Indians of Bengal, 21; the Brahamese, 19. The Chinese, properly speaking have no alphabet, unless we consider their characters expressive of words as such; if so, it will be found to amount to about 80,000. The Egyptian has four alphabets; the first consists of 23 letters, second of 24, third of 20, and the fourth of 25. The Etruscan, three alphabets; first of 23, second of same number, and third of 24. The Pelasgi *Græcæ* had three alphabets; the first two of 16 letters each, and the third of 20: the Japanese, 48. The Irish, three alphabets; the first of 20, called *Pœni Celtic*, the second of 18, the third of 20, called *Ogam*, a term in their language importing *mystery*, according to General Vallancey; the second is also called *Croabh*, and the third *O'Sullivan's*, but both are *Ogamic*. The Malabaric, 51; the Meso-GOTHIC, 28;

the *Norman* has two, of 24 each; and also an *Anglo-Norman*, which is the same with those illuminated capitals, which ornament ancient missals: the *Saracen*, four, the first consists of 25, the second of 26, and the last two of 24 each; the *Servian* has three, two of 25, and a third of 36. There was a *Syrio-Gallilean*, of 22; a *Syrio-Hebraic*, of 23; the *Tumoulic*, of 19; *Teutonic*, two, of 23 and 19 each; the *Welch*, 40; the *Talengaic*, of 52; and the *English* of 26 letters.

Of these alphabets it is said that the whole of the oriental languages, except what has been before observed with respect to the *Egyptian*, or *Coptic*, are derived from the *Hebrew* in the first place; that the whole of the western languages are evidently of *Latin* original, which came itself from the *Greek*, which was borrowed of the *Phœnician*, derived, it is said, from the *Hebraic*; therefore it is contended by many of the best informed, in whose opinions we now express ourselves, that either mediately or immediately all languages were derived from the ancient *Hebrew* or *Samaritan*.

We know to what extent, or rather we do *not* know the extent to which the partiality of the human mind will sometimes carry itself, to support a prepossession. We have collected the best opinions we could find on the subject; they are now laid before the public, who will judge for themselves, not taking upon us to determine, in a matter of such weighty consideration.

If we have erred, it was not intentionally; and provided such should be discovered, it will be *seen* that we have mistaken the path in *good company*.

SEALING-WAX, SEALS, &c.

Besides metals, five other mediums are enumerated by ancient writers, wherewith letters and public acts were sealed: *i.e.* *terra sigillaris*, cement, paste, common wax, and sealing-wax.¹ That the *terra sigillaris* was used by the *Ægyptians*, we have the evidence of *Herodotus*, and which by inference, is strengthened by that of *Moses*, who speaks of seal-rings, or *signets*,² whence we may infer that they had a medium of some sort, wherewith they sealed. This *lacuna* *Herodotus* supplies, affirming it in direct terms, and assigning a name to the substance they used for that purpose.

¹ Gattereri Elementa Artis diplomaticæ. Goettingæ, 1765. 4to. p. 285.

² Vide Goguet's Orig. des Loix.

This circumstance was only rendered questionable by *Pliny*, who alleges the *Egyptians* did not use those things in the following words: *Non signat Oriens aut Aegyptus etiam nunc, litteris contenta solis.* Lib. xxxiii. c. 1.

Herodotus thus expresseth himself: “The Egyptian priests bound to the horns of cattle fit for sacrifice pieces of papyrus with sealing-earth, on which they made an impression with their seal; and such cattle only, could be offered up as victims.”³

Lucian speaks of a fortune-teller, who ordered those who came to consult him to write down on a bit of paper the questions they wished to ask, to fold it up, and seal it with clay, or any other substance of a like kind.⁴

Such earth appears to have been employed in sealing by the *Byzantine* emperors; for we are told that at the second *Nicene Council*, image worship was defended by one saying: “No one believed that those who received written orders from the Emperor, and venerated the seal, worshipped, on that account, *the sealing-earth, the paper, or the lead.*”⁵

Cicero relates, that *Verres* having seen in the hands of one of his servants, a letter written to him from *Agrigentum*, and observing on it an impression in sealing-earth, (*cretula*,) he was so pleased with it that he caused the seal-ring with which it was made to be taken from the possessor.⁶

³ Σημαίνεται βύβλω περι τα κέρεα ἐλίσσων. Καὶ ἐπειτα γῆν σημαντίδα ἐπιπλασας, ἐπιβαλλει τον δακτύλιον. *Herodot. lib. ii. c. 38. edit. Francofurti, 1608. fol.*

⁴ Εε βιβλίον ἐγγράφαντα, καταρράψαι τέ, και κατασημάνασθαι κηρῶ ἢ πηλῶ ἢ ἄλλω τοιούτω. *Lucian. in Pseudomant.*

⁵ Ο κέλευσιν βασιλέως δεξάμενος, και ἀσπασάμενος τὴν σφραγίδα, οὐ τον πηλον ἐτίμουσεν, ἢ τὴν χάρτην, ἢ τὸν μολυβδον, ἀλλὰ.—*Act. iv. ap. Bin. tom. iii. Concil. part. i. p. 356.* “Whether the γη σημαντίς, however, of *Herodotus* and the πηλος of *Lucian* and of the *Byzantine* be the same kind of earth, can be determined with as little certainty as whether the *creta*, called by some Roman authors a sealing-earth, be different from both.”—*Beckmann.*

⁶ Cum Valentino ejus interpreti epistola Agrigento allata esset, casu signum iste animadverit in *cretula*; placuit ei; exquisivit unde esset epistola; respondit Agrigento: iste litteras ad quos solebat, misit, ut is annulus ad se primo quoque tempore afferretur. Ita litteris istius patrifamilias, L. Titio cuidam, civi Romano, annulus de digito detractus est. *Orat. in Verrem, iv. c. 9.*

A difference has existed between some persons in reading the above passage; certain people contend the above *cretula* should be read *cerula*; this reading would so effectually alter the sense, that instead of the *terra sigillaris* we are contending for, we should discover that the seal taken perforce by *Verres*, was from his having seen a seal of *wax*, instead of *clay*. Also, in the previously cited acts of the council of Nice, instead of *πηλον*, some read *κηρον*: but the reason for the alteration appears inadequate; likewise in the before-quoted passage from *Lucian*; it is expressly said, that people sealed *κηρῶ ἢ πηλῶ*. *Reiske* comments on the passage, and proposes the amendment, yet he admits that *πηλὸν* may be retained. *Stephen* does not give that meaning to this word in his *Lexicon*. *Pollux* and *Hesychius* tell us, that the *Athenians* called sealing-earth *ρύπον*. The former,

Also the same orator, in his defence of *Flaccus*, produced an attestation sent from *Asia*, and proved its authenticity by its being sealed with Asiatic sealing-earth; with which, said he to the auditors, as you daily see, all public and private letters in *Asia* are sealed: and he showed, on the other hand, that the testimony brought by the accuser was false, because it was sealed with *wax*, and for that reason could not have come from *Asia*.⁷ The scholiast *Servius* relates, that a sibyl received a promise from *Apollo*, that she should live as long as she did not see the earth of the island of *Erythræa* where she resided; that she therefore quitted the place, and retired to *Cumæ*, where she became old and decrepid; but that having received a letter sealed with *Erythræan* earth, (*creta*,) when she saw the seal she instantly expired.⁸

No one, however, will suppose that this earth was used without preparation, as was that to which is given the name of *creta*, chalk; for, if it was of a natural kind, it must have been of that species called *potter's clay*, as that clay is capable of receiving an impression and of retaining it subsequent to hardening by drying. It is believed that the Romans, under the indefinite term *creta*, often understood a kind of potter's earth, which can be proved by many passages in their numerous writers. *Columella*⁹ speaks of a

Onomast, x. 14. 59, says, *Non ignorandum, quod ceram signando idoneam, τὸν ἐπιτίθειντον ἐις τὸ κατασηματίσθαι υπὸν, veteres ρύπον nominaverunt et ρύπους, ut in Lysistrate Aristophanes; et nihil ita bene conclusum esse, quin obsignationes, ρύπους, anellatis; and the latter, Ρύπον Αττικὸν τὸν ἐις τὰς σφραγίδας υπὸν λεγουσιν; Attici ρύπον vocant ceram cuius ad sigilla usus est.* Stephen says, in his *Lexicon*, vol. iii. p. 727, that *rhypos*, in this evident sense, occurs in *Cicero's Letters to Atticus*: *In v. l. annotatur, legi et apud Cic. in Ep. ad Att. rhypos pro ceris sive formis unde sigilla fiebant, fortasse a situ vetustatis.* But, notwithstanding *Cælius Rhodiginus* mentions the same thing, *Lection. Antiq. xxi. 23*, as follows, *Pro caeris quoque in epistolis ad Atticum legimus rhypos, de vetustatis ratione nomenclatura accersita*; that expression does not, at present, appear in *Cicero*.

⁷ Hæc quæ a nobis prolata laudatio, obsignata erat creta illa Asiatica, quæ fere est omnibus nota nobis, qua utuntur omnes non modo in publicis, sed etiam in privatis litteris, quas quotidie videmus mitti a publicanis, sæpe unicuique nostrum. Neque enim testis ipse, signo inspecto, falsum nos proferre dixit; sed levitatem totius *Asiæ* protulit, de qua nos et libenter et facile concedimus. Nostra igitur laudatio—consignata creta est; in illo autem testimonio, quod accusatori dicitur datum, ceram esse videmus.—*Orat. pro Flacco*, c. 16.

⁸ Sibyllam *Apollo* pio more dilexit, et ei obtulit poscendi quod vellet arbitrium. Illa hausit arenam manibus, et tam longam vitam poposcit. Cui *Apollo* respondit, id fieri posse, si *Erythræam*, in qua habitabat, insulam relinquaret, et eam nunquam videret. Profecta igitur, *Cumas* tenuit; et illic defecta corporis viribus vitam in sola voce retinuit. Quod cum cives ejus cognovissent, sive invidia sive commiseratione commoti, ei epistolam miserunt creta antiquo more signatam; qua visa, quia erat de ejus insula, in mortem soluta est.—*Serv. ad lib. vi. Æneid*, p. 1037.

⁹ Ex ea creta qua fiunt amphoræ, lata vasa in modum patinarum fieri jubebat. *Lib. xii. c. 43.*

The manufactory for *amphoræ*, *vases*, &c. of the Romans, and with which articles they supplied their colonies, was in the Grecian pottery in the island of *Samos*,

kind of chalk of which wine-jars and dishes were made, of which species, it is conjectured, Virgil speaks when he calls it adhesive.¹⁰ The ancient writers on agriculture give precisely the same name to *marl*, which was employed to manure land: now, both chalk and marl in their *natural state* are extremely inapplicable to the purpose for which we are led to believe the *terra sigillaris* was used; therefore, admitting the Roman *creta* was composed of them, those substances must necessarily have undergone some laborious process, in order to render them proper for the purpose to which they were applied.

Notwithstanding, none can feel a higher respect for the author, Beckmann, to whom we are indebted for many of the preceding observations, than is cherished by ourselves; yet, strongly as we are influenced with this impression, we cannot help observing, consistent with that duty we owe to the public, that we cannot divest ourselves of the opinion that he is only trifling with the public feeling, perhaps for the ostentatious display of his own learning: so many objections and of so little weight are raised, that he really appears to write only for the purpose of raising new objections to passages which, in our comprehension, are extremely simple. Insomuch so, that we cannot help applying to him a passage which occurs in a song of the Swan of Twickenham, who sings:

“ Gnaw'd his pen, then dash'd it on the ground,
“ Striking from thought to thought, a vast profound.
“ Plung'd for the sense, but found no bottom there,
“ Yet wrote, and floundered on in mere despair.”

We would not be illiberal or capricious, nor do we presume to any extra portion of intelligence; yet, we think we can in a few words discuss the topic, and, perhaps, satisfactorily, on which he has employed so many pages. Those terms which have puzzled our author with learned difficulties, really appear to us as susceptible of a palpable interpretation, and applicable to both or either of the senses in which they are used, as are any words in the language of ancient Rome. Accordingly we find the term *creta*, implies either *chalk*, *fuller's clay*, *loam*, *white paint*, and *Asiatic earth*, termed *creta Asiatica*; and, in brief, it appears a mere generic name for any kind of earth, *raised from below the surface of the soil*: this is its sense. But there cannot be a question, from what is known of the preparation of

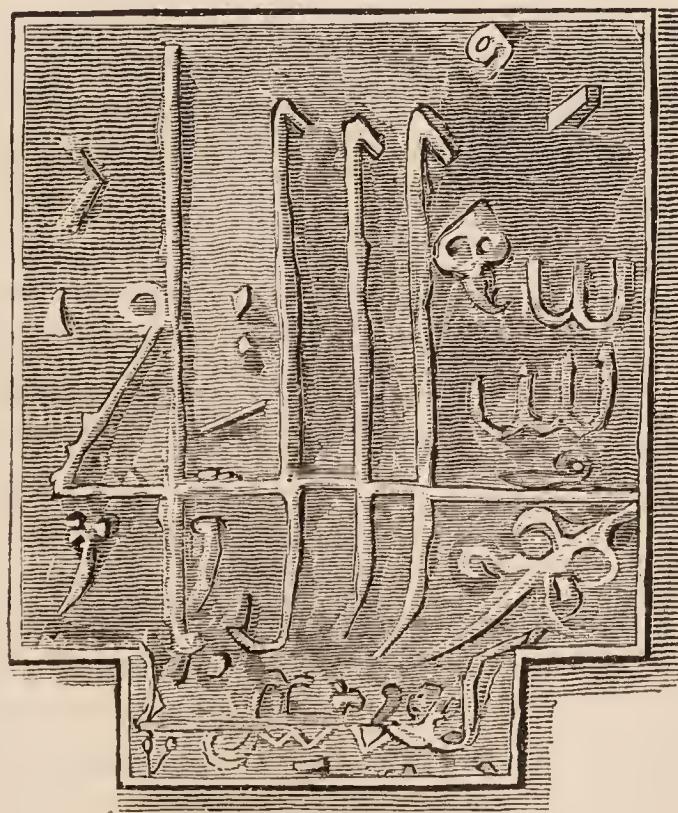
opposite to Mycale, in the Ionian sea, famous for its wine and earthen-ware; also eminent for being the favourite island of Juno, that is, its air is pure.

¹⁰ Et *creta* solidanda tenaci. *Georg.* i. v. 179.

clay and earths, for *terra cotta* and other plastic purposes, which undergo a variety of washings, kneadings, &c. that similar preparations were requisite, in order to bring it to so curious, so delicate a purpose as that to which the *terra sigillaris* was applied. And *fosse*, in the sense used by *Varro*, admits of nearly a similar description, it appearing as a *pronomen* for the same thing; and indicates either *marl*, *peat*, *loam*, *chalk*, and, in brief, any earthy substance which may be raised from below the terrestrial surface.

We have evidence every day in our fruit-shops, that in certain countries this kind of earth is yet employed for clearing up jars of dried fruits brought from *Oporto*, *Smyrna*, and other countries; as these appear to be composed of white chalk of a texture somewhat similar to common mortar. The warmth of the atmosphere where used, soon hardens and prevents the passage of air to the contents; the jars themselves being oftentimes only dried in the sun.

Thus, it appears evident that prepared earths were first used for the purpose of sealing; their adhesive, or, as *Virgil* has it, tenacious qualities being wonderfully improved from manual labour. Next paste was employed, prepared from dough, of which we have a sample in a seal bearing the impression of that device adopted by *Ali*, the second of that name, successor to *Mahomet*, of which we give an impression.



Inscription attached to Seal:

“Tout passera, mais Dieu subsistera éternellement, c'est moi.”¹¹

¹¹ Moushey Ali, qui ai écrit ceci.

To paste succeeded common wax, sometimes slightly tinctured with a green tint, the effect of endeavouring to give it a blue colour, as vegetable blues turn green by the process of the heat employed in melting; whilst mineral or earthy blues all sink to the bottom, from superior gravity. This was the material employed in sealing public acts in England as early as the fifteenth century. We have an anecdote of the Duke of Lancaster having no seal to seal a deed made between him and the Duke of Burgoyne, but from what appears in the attestation, which, with the instrument itself, according to the general custom of the day, runs in rhyme thus:

“ I, John of Gaunt,
 “ Doe gyve and do graunt,
 “ To John of Burgoyne,
 “ And the heire of his loyne,
 “ Sutton and Putton,
 “ Untill the world’s rotten.”

The attestation runs:—

“ There being no seal within the roof,
 “ In sooth, I seal it wyth my tooth.”

A good example is this of the simple brevity of the time, and a severe lecture upon the eternal repetitions of modern legal tautology, whereby the limitations and special uses of deeds are made, perhaps, not according to the necessities of the case, but are lengthened from selfish purposes.

The great charter, which gives an assurance of the rights of Englishman, is sealed with white wax; as may be seen in the British Museum.

We have observed, in the discourse upon *heraldic* bearings, that the first arms used as a seal in England, were those of the tyrannical subjugator of English rights, *William*, commonly called the Conqueror, and that they were brought from Normandy.

Although *Fenn*, in his collection of original Letters of the last half of the fifteenth century, published in London, 1787, 2 vol. 4to. has given the size and shape of the seals, he does not apprise us of the substance with which they were composed. Respecting a letter of 1455, he says only, that “ The seal is of red wax,” by which, it is presumed, he means common wax; and though perhaps, not equal in quality to such as is now used, yet it was made of nearly similar materials.

Tavernier, in his Travels, says, that in Surat *gum lac* is melted and formed into sticks, like sealing-wax.

Wecker also gives directions to make an impression with calcined gypsum and a solution of gum or isinglass. *Porta*, likewise, knew that this might be done, and, perhaps, to greater perfection with amalgam of quicksilver.

Among the records of the Landgrave of Hesse-Cassel are some letters of 1563, sealed with red and black wax. In the family archives of the Rhingrave Philip Francis von Daun, the oldest letter sealed with wax, known in Germany, is found, of the date of August 3, 1554; it was written from London by an agent to that family, of the name of Gerrard Herman. The colour of the wax is dark red, and very shining.

The oldest receipt known in Germany for making sealing-wax was found by M. von Murr, in a work by Samuel Zimmerman, citizen of Augsburg, published in 1579. The copy in the library of the university of Gottingen is signed by the author himself. Its title is “*Neue Titularbuch, — sambt etlichen hinzugehanen geheimnüssen und künsten, das lesen und die schreiberey betreffendt. Durch Samuelaen Zimmerman, burger zu Augspurg.*” 4to. 1579, p. 112.

“ To make hard sealing-wax, called Spanish wax, with which if letters be sealed, they cannot be opened, without breaking the seal: take beautiful clear resin, the whitest you can procure, and melt it over a slow coal fire. When it is properly melted, take it from the fire, and for every pound of resin add two ounces of cinnabar, pounded very fine, stirring it about. Then let the whole cool, or pour it into cold water. Thus you will have beautiful red sealing-wax.

“ If you are desirous of having black wax, add lamp-black to it. With smalt or azure, you may make blue; with white-lead, white; and with orpiment, yellow.

“ If, instead of resin, you melt purified turpentine in a glass vessel, and give it any colour you choose, you will have a harder kind of sealing-wax, not so brittle as the former.”

It may be remarked, that in these recipes for the fabrication of sealing-wax there is no mention of *gum lac*, which is known at present as a chief ingredient in the composition of this article.

Zimmerman’s sealing-wax approaches very near to the quality of that known as *maltha*, whence, we may conclude, that the manufacture of it did not originally come from the East Indies. The most ancient mention of sealing-wax occurs in a botanical work, treating of the history of aromatics and simples, by *Garcia ab Horto*, published at Antwerp,

in 1563, 8vo. where the author, speaking of gum lac, says, that those sticks used for sealing letters are made of it; at which time sealing-wax was very common among the Portuguese; and has since been manufactured chiefly in Holland.

M. P. E. Spiess, principal keeper of the records at Plessenbergh, says, respecting the antiquity of wafers in Germany, that the most ancient use of wafers he has known occurs in a letter written by D. Krapf, at Spires, in 1624, to the government of Bayreuth. The same authority informs us, that some years after Forstenhäuser, the Brandenburg factor at Nuremberg, sent such wafers to a bailiff at Osternohe. During the whole of the seventeenth century, wafers were not used in the chancery of Brandenburg, and only by private persons there.

Seals, it appears, from certain passages with which we are acquainted of Egyptian history, that parallel with, and, perhaps, anterior to the Israelitish ingress, these seals or signets were formed or cut in emeralds, the native produce of that country. Other precious stones, metals, steel, lead, and a variety of materials, but chiefly of a hard and precious kind, have been ever employed for that purpose.

ASTRONOMY.

We are not greedy of delusion ourselves, neither would we lead others into error; but, on the contrary, are desirous to avoid all deception, as we are over studious to give the most rational origin, and where we cannot get at the genuine history of those objects which engage our attention; whenever this is uncertain, we resort to experience, nature, and reason, and furnish the most correct explication our contracted circle of information will permit. Whenever we discover the clue of history, we collect the most satisfactory detail our limits will afford us to insert. Guided by the preceding notions, and directed by those principles we have endeavoured correctly to conceive, and faithfully to pourtray our own conceptions in the best manner our experience might enable us. To make a just distinction between metaphorical allusion and literal explication; ever endeavouring to discriminate between serious assertion and studied fable.

But, as is noticed by our learned friend, the author of *Indian Antiquities*, in his “Observations on the Ruins of “Babylon, &c.” with this just and experienced remark, in which we fully coincide, where he says, “That in respect to “the early ages of the world, all that remains of genuine “history, except that contained in the sacred annals, is “only to be obtained through the mazes of **MYTHOLOGY**.”

It must be confessed, to sift this corn from the accompanying chaff, where every effort which the superior ingenuity of *Greece* could devise to render fable as current as general history, was resorted to, is no small task; that it requires the operation of the best exercised reason, and the assistance of extraordinary judgment, which is only to be attained through the medium of extensive experience, and the exercise of clear and discriminative powers: then we presume not to enjoy the best of possible acquisitions of this kind, but the best in our power, we have endeavoured to collect, and summoned to our assistance; of which the public will appreciate our labours.

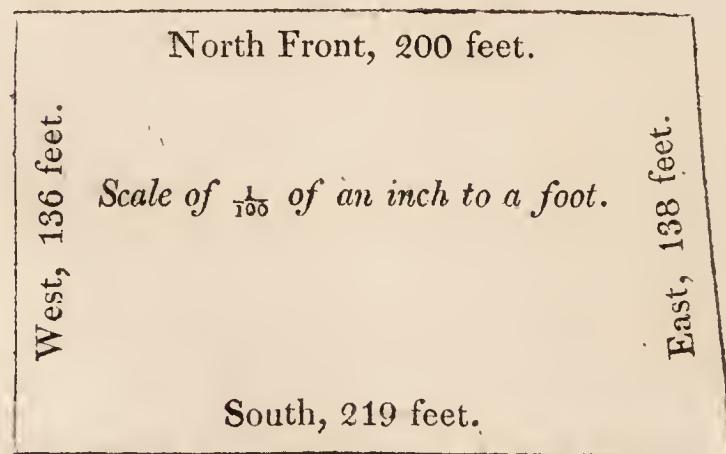
If the application of observations like the preceding ever come *apropos*, surely they apply to the present article; since from the *sideral* science, all the errors of an idolatrous race proceeded in the major part of the population of the ancient world: from thence also proceeded the most sublime imagery which embellishes the syren voice of poetic song, the grandest metaphor, and the sweetest allegories, which ornament the transcendent eloquence of the most able rhetoricians of *Greece* and *Rome*; the fire of exquisitely natural and most noble allusions which enliven and embellish their historic pages. The sweetest philosophical explications also flowed from thence, which ornament the various immortal works of their transcendent Poets, Orators, Historians, Natural and Moral Philosophers, and, in brief, of every description of the sublimest genius of ancient *Greece* and *Rome*, in their most divine effusions.

It will appear, we believe, that the *first* astronomers of Chaldea, Phœnicia, and Egypt, are not now known as astronomers, by name, if we except the person of the royal **NIMROD**, the founder of the Chaldean empire, which name is often confounded with **BELUS**; sometimes one is put for the other, and often **Belus** is called the son of **Nimrod**. How the truth of this was, we shall not, at present, determine: be it as it may, it is allowed on all hands that the *sideral* science claims for its founder, no less a person than the founder of the *first* monarchy in the world. That this science was first introduced by the founder of the Tower of **Babel** is not questioned, because it is most evident, that in that country there must have existed from necessity, the expediency of the most approved observations which could be made upon this eminently useful science; where, on account of the excessive solar heat, people generally travel by night; where, for hundreds of miles, are nothing but pathless deserts, with an horizon as boundless and little

impeded as that of the ocean: assuredly, under such circumstances, the local situation of the site of the immense Observatory of Babel must point out the expediency of procuring some intelligence from the position which the inhabitants discovered the host of Heaven to appear in at rising, setting, &c.; for, from what will appear in the course of this disquisition, it will be very evident, that the Tower of BABEL was built for the purpose of an astronomical observatory: farther, that the climate of Chaldea was most favourable to the exercise of that sublime art, will not admit of a question, when we consider the atmosphere is so pure, so clear, so free from exhalation, that at night the *sky* is said to resemble an immense canopy of black velvet studded with embossed gold, from the appearance of the stars; and that it was not only the appearance of the stars, their rising, setting, and motion, by which they knew time was to be measured; but also the distinction between one star and another could be correctly ascertained from their usual colour: here it was the various planets, zodiacal constellations, and the other asterisms in both hemispheres, received their primary names.

The preceding circumstance, it is conceived, fixes the local place where the science had its origin:

From the specification we have an opportunity of making of the construction of the Tower of Babel, as called in the Scriptures, the same with that of *Belus*, as known in *Herodotus*, *Diodorus Siculus*, and other human authors, there cannot remain a shade of doubt, but that our conception is strictly correct. The site is thus described by *De la Valle*, from admeasurement, in 1616.



Hence, we may observe it was a parallelogram, with sides of unequal length. *Herodotus* thus describes it:—“ The “ Temple of Jupiter-Belus occupies the other [square of the “ city], whose huge gates of brass may be seen. It is a square

“ building ; in the midst rises a TOWER of the height of one
 “ furlong, upon which, resting as a base, seven other turrets
 “ are built in regular succession. The ascent is on the out-
 “ side, which, winding from the ground, is continued to the
 “ highest tower : in the middle of the whole structure, there
 “ is a convenient resting place.”

Diodorus Siculus says, this Tower was decayed in his time, but, in his description of Babylon, thus speaks of it. Describing the action of *Semiramis*, who flourished 2944 years before Christ : — “ In the middle of the city, she built “ a Temple to Jupiter-Belus ; of which, since writers differ “ amongst themselves, and the work is now wholly decayed, “ through length of time, there is nothing that can with “ certainty be related concerning it ; yet it is apparent it “ was of an exceeding great height ; and that by the ad- “ vantage of it, the Chaldean astrologers exactly observed “ the rising and setting of the stars : the whole built of brick, “ cemented with brimstone, with great art and cost. Upon “ the top she placed three statues of beaten gold, of “ Jupiter, Juno, and Rhea : that of Jupiter stood upright, “ in the posture as if he was walking ; he was forty feet in “ height, and weighed one thousand Babylonish talents. “ The statue of Rhea was of the same weight, sitting on a “ golden throne, having two lions standing on either side, “ one at her knees, and near to them two exceeding great “ serpents, of silver, weighing thirty talents each. Here, “ likewise, the image of Juno stood upright, and weighed “ eight hundred talents, grasping a serpent by the head, “ in her right hand, and holding a sceptre, adorned with “ precious stones, in her left. For all these deities there “ was placed a common table made of beaten gold, forty “ feet long and fifteen broad, weighing five hundred talents ; “ upon which stood two cups, weighing thirty talents, and “ near them as many censers, weighing three hundred “ talents : there were, likewise, placed three drinking bowls, “ of gold ; the one to Jupiter weighed two hundred talents, “ and the others six hundred each.”

We have been thus circumstantial in our description of Babylon, for obvious reasons : 1st, that it was the first local situation where, since the Deluge, men had associated for civil purposes ; and, 2dly, because it was the original station where the sideral science was cultivated. From *Chaldea*, Astronomy travelled to Egypt, where she was studied for many ages : she also went to *Phœnicia*, where she was regarded with equal attention. But the peculiar occasion which the Phœnician people had to improve their acquaint-

ance with this science will appear, upon reflecting that these people occupied a narrow and sterile tract of land between the Mediterranean and Arabian seas; therefore they found it essentially necessary to improve their situation, by those means which Divine Providence had apparently marked out for them to resort unto: we accordingly find them applying to mercantile industry; as a commercial people, in this character, they were the ready medium of communication between every part of the then known world. In consequence, they had factories or mercantile stations up the Mediterranean; but particularly on its European side, on the shores of the Atlantic, and even in the British seas: we recognise their occupying *Marseilles* and others on the coast of France; *Cades*, now known as *Cadiz*, on that of Spain; the *Cassiterides*, or *Lizard Point*, and other places in *Cornwall*, where they traded for tin, in the British isles. In brief, their commercial spirit carried them to every part of the globe: by the bye, admitting rational belief be allowed to *Plato* and *Solon*,¹ we shall find that they had, in the first ages, explored the Atlantic ocean, and even discovered America. A great variety of authorities may be produced to prove this assertion: we quote *Sanchoniatho apud Eusebium, præt. Evang. p. 30*; *Honorius de Orig. Gent. Americ. lib. ii. c. 6*, who proves the *Phœnicians* made three distinct descents upon the American coast; *Philostrat. in vita Apollion. lib. v. c. 1. p. 201*, ed. Paris, 1608; *Bochart, Canaan, p. 709*, et preced. *Diod. Sic. lib. v. p. 209*; *Aristoteli Opera, tom. iii. p. 395*, edit. Basil, 1542: and that the inhabitants, discovered there by the Spaniards, gave the same names to the planets as had been assigned them in Asia; that their religious rites were similar, and general customs and manners the same, we refer to *Joseph Da Costa's Hist. of the Indies*, published in 1694.

This author was an eye-witness, and wrote from actual observation. The *Phœnicians*, in the exercise of their mercantile functions, had the most obvious necessity to cultivate the sidereal science. We find that they accordingly did so, and made various improvements and very important discoveries by their exercise. From the northern

¹ *Plato* wrote a work entitled *Ατλαντις*, which it is understood he composed from a relation he had from *Solon*, the legislator, and who had brought it from Egypt, of the *Phœnicians* having discovered a vast island in the Atlantic ocean, larger than Asia. Indeed, the report was so current in after times, among the *Carthaginians*, the same people, and the emigrations became so alarming, that the state caused it to be believed that the whole country was swallowed up in the ocean.

hemisphere being more known to them, than it was to the Chaldeans, they discovered that splendid asterism of most resplendent beauty, denominated *Conysuræ*, or the polar-star,—an asterism of the most singular service, before the properties of the magnet were discovered, and which star was sometimes called, from them, *Phœnix*.

From Phœnicia and Egypt the celestial science of astronomy was brought into Greece, with which people the Phœnicians were intimate; for they, by trade, having occasion to converse with the Greeks, and also from uniting in one national resemblance, the three opposite characteristics of merchants, soldiers, and men of science, the communications between the two people were very frequent. At every period, from the first establishment of the Grecian states, that highly eminent and intellectual people collected from all others every particular they could obtain in all matters having relation to sciences and the arts; those they cultivated with a success worthy of the motive which first induced them to make these collections. Loving knowledge for herself, they succeeded beyond all others in obtaining her favours.

The first Greek who appears on record to have cultivated the celestial science, with success, was THALES, born at *Miletus*, in Asia-Minor, B. C. 641; he explained the cause of eclipses, and predicted one. *Herodot.* i. 7; *Plin.* ii. 12, § 9; and *Plutarch. de Placit. Phil.* ii. 24. He also taught that the earth was round, and divided into five zones; he discovered the solstices and equinoxes, and likewise divided the year into 365 days. He had travelled into Egypt in search of knowledge, where he ascertained the height of one of the pyramids, from its shade. *Diog. Laert.* i. 27. He looked upon water as the principle of all things. *Cic. Acad.* iv. 37; *et Nat. D.* i. 10. From him the sect called the IONIC, had their origin.

ANAXIMANDER, his pupil, followed him, and supported the opinions of his great master; he was born before Christ, 610; he invented maps and dials, and is reported to have constructed a sphere. *D. Laert.* ii. 1; *Plin.* vii. 56. His ideas of the planets were, however, erroneous.

ANAXIMENES was a scholar of Anaximander, and born before Christ, 554. He taught that air was the origin of all things. *Cic. Acad.* ii. 57; *et Nat. D.* i. 10. He taught many erroneous notions: among others, that the earth was a plain, and the heavens a solid concave sphere, with the stars affixed to it like nails; whence the Greek proverb, *τι εἰσράπος εμπιστος*, *What if the Heavens should fall?* to which Horace alludes, *Od.* iii. 3. 7.

ANAXAGORAS of *Clazomene*, the pupil of, and successor to Anaximenes, born before Christ 560. The doctrines he supported are a strange association of important truths, mixed with the most gross absurdities. He taught that the world was made by a Being of infinite power; *Cic. Nat. D. i. 11*; that mind was the origin of motion; that the upper regions, which he called *aether*, were filled with fire, that the rapid revolution of this *aether* had raised large masses of stone from the earth, which being inflamed, formed the stars, which were kept in their places and prevented falling from the velocity of their motion. *Plut. Placit. Phil. ii. 13*. Which author says, a stone was shown in his time, which had fallen from the sun in the days of Anaxagoras. *Id. ii. 58*.

His ideas of the solar orb were extremely erroneous; alleging, according to different authors, various uncertain positions respecting the materials of which that planet is composed: one says, he said it was a vast mass of fire; another states his opinion, that it was red-hot iron; and a third, that it was of stone. He taught that the *Comets* are an assemblage of planets; that winds are produced in consequence of highly rarefied air; that thunder and lightning are a collision of clouds; earthquakes, by subterraneous air forcing its passage upwards; that the moon was inhabited, with others.

This philosopher removed his school from *Miletus* to *Athens*, which was thenceforth the grand seat of all learning. He had taught there for thirty years, when he was prosecuted for his philosophical opinions, particularly for his just ideas relative to the **DEITY**, and condemned to death. When sentence was pronounced, he said, — “ *It is long since Nature has condemned me to that.*” However, according to the laws of Athens, he was permitted an appeal to the people, in which his scholar, the immortal **PERICLES**, saved his life, by his eloquence. His sentence of death was transmuted into banishment: whilst in prison he determined exactly the proportion of the circumference of the circle to its diameter, denominated ‘ squaring the circle.’ *Plutarch.* He died at *Lampsacus*. *Cic. Tusc. i. 4*. **Archelaus**, his scholar, was the master of the divine **SOCRATES**. *Id. v. 4*.

PYTHAGORAS was another scholar of **Thales**, or rather of **PHEREKYDES**. *Cic. Tusc. i. 16*. The place of his nativity is uncertain; but having settled in the island of *Samos*, he is generally reckoned of that place. He travelled in search of knowledge through *Phœnicia*, *Chaldea*, *Egypt*, and *India*: however, meeting with little encourage-

ment, on his return to Samos, he passed over to Italy, in the time of Tarquin the Proud, or Superbus ; and opened a school at *Croto*, or *Crotona*, a city in the Gulf of *Tarentum*, where he had a number of students, and gained much reputation. His pupils were obliged to listen in silence for at least two years ; if talkative, longer ; sometimes for five years, before they were permitted to ask him any questions : for which time they were called *μαθηματικοί*, because they were set to study geometry, dialling, (*γνωμονικά*), music, and other higher sciences, (*disciplinæ altiores*) called by the Greeks, *μαθηματά*, *Gell.* i. 9. But the name of *mathematici*, was commonly applied to those who cultivated the *stellar* science, and who predicted the fortunes of men, by observing the stars under which they were born ; also denominated *γενεθλιακοί*, *vel Chaldaeī*. *Ibid.*

This luminary of science *first* assumed the appellation of *philosopher* : before him, those whose pursuits have now that title, were called *Σοφοί*, sages, or wise men ; he was the founder of the sect called the *Italic*. He was so much venerated whilst living, and his memory honoured when dead, by the Romans, that they attributed to him the learning of *NUMA*, who lived much earlier : *Liv.* i. 18 ; xl. 29 : about the year of the city 411, the Delphian oracle having directed the Romans to erect statues to the bravest and wisest of the Greeks, they conferred that honour upon *Alcibiades* and *Pythagoras*. *Plin.* xxxiv. 6.

He taught publicly, that the earth is the centre of the universe ; but to his scholars he gave his real opinions ; similar to those afterwards adopted by *Copernicus*, that the earth and all the planets move round the sun, as their co-centre ; and which doctrine he is presumed to have derived from either the Chaldeans or Indians : he thought that the earth is round and every where inhabited : hence, he admitted that we might have *antipodes*, which name is said to have been invented by *PLATO*. *Diog. Laert.* iii. 24.

Pythagoras was distinguished for his skill in *music*, which he first reduced to certain firm principles, and likewise for his discoveries in geometry. He first proved, that in a right-angled triangle, the square of the *hypotenuse*, or side subtending the right angle, is equal to the two other sides ; also that of all plain figures having equal circumference, the circle is largest, and of all solids having equal surfaces, the sphere is the largest. *Pythagoras* likewise taught, that all things were made of *FIRE*. *Plutarch. Placit. Phil.* ii. 6. That the Deity animated the universe, as the soul does the body ; which doctrine, with that of the *metempsychosis*, or

transmigration, he likewise taught; and which thoughts were adopted by Plato, and are most beautifully expressed by *Virgil*, *Æn.* iv. 724, &c. *Georg.* iv. 221: that the sun, the moon, the planets, and fixed stars, are all actuated by some divinity, and move each in a transparent solid sphere, in the order following: next to the Earth, the Moon, then Mercury, Venus, the Sun, Mars, Jupiter, Saturn; the sphere of fixed stars, the last of all: *Ciceronis Nat. D.* xiii.; *Macrob. Somn. Scip.* ii. 4: that those move with a sound inconceivably beautiful, which our ears cannot comprehend. Those eight spheres, he imagined to be analogous to the eight notes in music, *Cic. Somn. Scip.* 5.; *Macrobius, in loc.*

EMPEDOCLES, the chief scholar of Pythagoras, entertained the same sentiments with his master, concerning Astronomy. He is said to have thrown himself into the crater of Mount *Ætna*, to make himself pass for a god; or perhaps, which may approach nearer to truth, because he could not discover the cause of the eruption; or else in his endeavours to discover the cause. *Horat. Art. de Poetica*, 464. One of his iron sandals being thrown up by the volcano, the mode in which he perished was discovered.

PHILOLAUS, also a scholar of Pythagoras, and of ARCHYTAS, of Tarentum, *Cic. Orat.* iii. 34, first taught, publicly, the *diurnal motion of the earth upon its axis, and its annual motion round the sun*. This opinion *Cicero* ascribes to *Nicetus*, of Syracuse, and to PLATO, *Acad.* iv. 30; which passage first suggested to COPERNICUS, the idea of that system which HE established.

METEON, born at *Leuconæ*, a village near Athens, it is said, first introduced in Europe the LUNAR CYCLE, consisting of nineteen solar years, or nineteen lunar years, and seven intercalary months: it had been first adopted by the Chaldeans; Meteon published it at the Olympic games, where it was received with so great applause, that it was then universally adopted through the Grecian states, and their colonies, and got the name of the CYCLE, or GOLDEN NUMBER, to denote its excellence, which name it still retains.

It was also called the Great Year, (*Magnus annus vel orbis*;) *Elian*, x. 7.; which name was likewise applied to various spaces of time by different authors: by *Virgil*, to the solar year, to distinguish it from the monthly revolution of the moon. *Serv. in Virg. Æn.* i. 273. iii. 164; by *Cicero*, and others to the revolution of 600 years, or 3600 years, called also several ages, when all the stars shall come to the same position with respect to one another, as they were

in at a certain time before; called likewise ANNUS MUNDANUS, or VERTENS. *Macrob. in Somn. Scip.* ii. 11. *Censorin.* 18, which was supposed to contain 12,954 years. *Serv. in Ibidem.* or 15,000 years. *Macrob. ibid.* the beginning of this, or any other period was called an EPOCH.

The lunar cycle began 432 years before the commencement of our era, *Ælian*, xiii. 2.; and according to it the Greek calendars, which determined the celebration of their annual feasts, &c. were adjusted. Meteon is said to have derived his knowledge of this subject from Chaldea. (Vide the succeeding article, word SORROS.)

The opinions of the subsequently registered astronomer, XONOPHANES, founder of the *Eleatic* school, are so truly monstrous, that after the light which had appeared, he must have travelled with his eyes shut; or else the rage for novelty alike affected the scientific of Greece, as it did their literati; choosing to travel a long way for new thoughts, when they might have found much better at hand. XONOPHANES, among other whimsical opinions, maintained that the stars were extinguished every morning, and illuminated every evening, *Plut. ibid.* ii. 13.; that the sun is an inflamed cloud, *ibid.* c. 20; that eclipses happen by the extinction of the sun, which is afterwards lighted up, c. 24; that the moon is ten times larger than the earth; that there are many suns and many moons to illumine different climates. *Plutarch. ibid. Lactan. Divin. Instit.* iii. 23.

The *Eleatic* school, was chiefly famous for the study of logic, *Logica vel dialectica*, or the art of ratiocination, first invented by ZENO, of Elea. *Cic. Orat.* 32. Those of this sect paid but little attention to sciences, or the study of nature. Philosophy was anciently divided into three parts, natural, moral, and the art of reasoning, called DIALECTICA, *vel Logica*. *Plutarch. de Placit. Philosoph. pronom.* XONOPHANES, was followed by Parmenides, his scholar, who, in addition to his master's absurdities, taught that the earth was habitable in only the two temperate zones, *Plutarch. de Placit. Philosoph.* iii. 11; that the earth was suspended in the middle of the universe, in a fluid lighter than air; that all bodies left to themselves, light on its surface, *Ibid.* 15. This bore a slight resemblance to the Newtonian doctrine of attraction.

DEMOCRITUS of Abdera, a scholar of LEUCIPPUS, who flourished 456 years before Christ, was the first publisher of the Atomic Cosmogony, invented by Mochus, the Phœnician, said to have been received by his master Leucippus.

Both admitted plurality of worlds. Democritus was the first who taught that the milky way is occasioned by the confused light of an infinite number of stars, *Plutarch. in Placit Philosoph.* iii. 1; *Manil.* i. 753; which doctrine is still maintained by the best informed of philosophers. He also extended that idea to comets, *Plutarch. ibid. ii*; the number of which *Seneca* says, the Greek philosophers did not know, *Senec. 2. Nat. vii. 2*; and that Democritus suspected there were more planets than we could see, *Ibid. 3*, which was also the opinion of others; the truth of which belief has been verified of late years, by the discoveries of *Harding, Olbers, and Herschell*, in the discoveries of the *Pallas, Juno, Vesta*, and the *Georgium Sidus*; which opinion of Democritus was maintained by many others, *Gell. xvi. 1*.

Democritus is considered as the parent of experimental philosophy; the greatest part of his time was devoted to it; (*ætatem inter experimenta consumit, et quæ esset expertus annulo signabat, Pet. Arbiter. 88. et Vitruv. ix. 3.*) and he is said to have made many important discoveries, *Senec. Ep. 90*. He, like Meteon and Newton, maintained the absurd idea of the existence of a vacuum, which was denied by Thales and Descartes. Democritus also maintained that the sea was constantly diminishing, *Diog. Laert.* He declared that he would prefer the discovery of one of the causes in the works of nature, to the possession of the Persian monarchy, *Euseb. xiv. 27*. Often laughing at the follies of mankind, he was thought by the vulgar to be out of his mind; but *Hippocrates* being sent to cure him, soon found him to be the wisest man of the age, *Diog. Laert.*; and *Seneca* reckons him the most acute and ingenious of the ancients, on account of his many useful inventions; particularly his ingenious making of artificial emeralds, tinging them of any colour; of softening ivory, dissolving stones, &c. *Ep. 41*.

Although the chief attention of **PLATO** and **ARISTOTLE** was directed to other grand objects, yet they much contributed to the improvement of astronomy. Notwithstanding, the most famous in this respect was **EUDOXUS**, the scholar of Plato, who was famous for his skill in astrology, *natural* and *judicial*, or the art of foretelling future events by the relative situations of the stars, of their various influences, *Cic. Divin. ii. 42*, an art which prevailed for many ages among the ancients, and is yet assiduously cultivated by the modern Arabians and other orientalists, although in a great measure exploded in European nations. By the former of which divisions of this science are foretold the changes of seasons, rain, wind,

thunder, cold, heat, famine, diseases, &c. from a knowledge of the causes that are believed to act upon the earth and its atmosphere; whilst the latter foretold the characters, fortunes, &c. of men, from the stellar disposition at the moment of their respective nativities.

This philosopher, Eudoxus, spent much of his time on the top of an high mountain, to observe the motion of the stars, *Petron.* 88. He regulated the Greek year, as Cæsar did the Roman, *Lucan,* x. 187. Had the ancient Grecian astronomers been equally attached to experiment with Democritus, they might have arrived at more certain conclusions; but they were content with speculative theory, and spoke rather from conjecture than observation; whence both *Strabo* and *Polybius* treated as fabulous the since recognised assertion of *Pythias*, a famous navigator to the north, who had sailed to a country, presumed to have been Iceland, where he said the sun, in the middle of summer, never set, *Strabo*, ii. p. 104, 114, and 115.

The most important improvements in astronomy were made in the school of ALEXANDRIA, founded by *Ptolemy Philadelphus*; and which seminary flourished for 923 years, till the invasion of the Saracen army, during the caliphate of *Omar*, under the command of *Amrou*. Those astronomers and scientific men who flourished there, were chiefly Greeks, or of Grecian extraction,—the most learned men, being invited here by the liberality of the Ptolemies. The first who distinguished themselves were **TIMOCARIS** and **ARISTILLUS**, anterior to the foundation of the library, which was founded 300 years before Christ. Those men, Timocaris and Aristillus, who tried to determine the places of the different stars in the heavens, and thus to trace the course of the planets. The next, and most eminent man, was **ARISTARCHUS**, about 264 years before Christ, who taught that the sun was about nineteen times further from the earth than the moon, (which is not the twentieth part of its real distance,) although the philosophers of the Pythagorean school did not consider it above three times, or perhaps only one and a half further distant. Aristarchus also taught that the moon was fifty-six diameters of our earth from this globe, which opinion comes near to truth: he believed it to be scarcely one third of its real size. He was widely erroneous in his conception of the sun's dimensions. He also, in conformity to the doctrines of *Pythagoras* and *Philolaus*, supposed the sun to be placed in the centre, and that the earth moved round it; on which account he was accused of impiety, as disturbing the repose of *Vesta*.

and the Lares, *Plutarch. de Luna.* This opinion was not however retained by his successors, in the Alexandrian school. Contrary to the doctrine of the Greek philosophers, he taught that the stars were at different distances, and that the orbit of the earth round the sun was an insensible point, in comparison of the immense distance of the stars. The only work of Aristarchus which remains, is on the magnitude and distance of the sun and moon.

Very nearly contemporary with Aristarchus, was EUCLID, the geometrician of Alexandria; MANETHO, an astrologer and historian; and *Aratus* and *Cleanthus*, disciples of ZENO, the stoic philosopher, all of whom contributed to the enlargement of astronomical knowledge; but particularly the two first named. ERATOSTHENES, born at Cyrene, 276 years before Christ, succeeded Aristarchus, being invited by *Ptolemy Evergetes*. This professor, is said, to have been the inventor of the ARMILLARY SPHERE, an instrument or machine composed of moveable sides, representing the equator, the two colures, with the meridian; all of which turned round on an axis directed to the two poles of the world; each of which circles were anciently called *armilla*, and the whole machine *astrolabus*. This, however, is said to have been known long before *Eratosthenes*; *Diog. Laert.* i. 119; he probably perfected it. All instruments which could be contrived for the promotion of this divine science, were furnished at the public expense, and placed within the observatory of Alexandria. Assisted by these instruments, *Eratosthenes* first undertook to measure the obliquity of the ecliptics, or rather the double of that obliquity, that is, the distance from the tropics, which he made to be about forty-seven degrees; the obliquity, or half of this distance, twenty-three degrees and a half. This grand attempt was to ascertain the exact distance of a degree of the meridian, and thus to determine the circumference of the earth; which he accomplished with wonderful exactness, considering the period in which he lived; and he performed this by the same method since adopted by the moderns who have succeeded him. He is also reported to have discovered the true distance of the sun from the earth, *Plutarch. Placit Phil.* ii. 31.

The great ARCHIMEDES, lived contemporary with *Eratosthenes*, that eminent geometrician of Syracuse, whose inventive genius in mechanics, had constructed engines which protracted the fall of that capital, with its island, Sicily, to the almost omnipotent power of Rome, for a considerable period. Likewise CONON, of Samos, who

collected and composed an account of the observations on all eclipses of both luminaries, observed by the Egyptians, as we are assured by *Seneca*, 2 *Nat.* vii. 3. Also *Apollonius*, of Perga, who composed a treatise on conic sections, on the properties of curved lines, arising from the section of a cone by a plane. He was the first who tried to explain the apparent stopping and retrogradation of the planets, by cycles and epicycles, as they were called, *i. e.* circles within circles, *Ptolemy Almagest.* xii. 1; which idea took its origin from the absurd idea of *Eudoxus*, ascribing to the planetary motions as many solid spheres as these appear to be different. Afterwards lesser circles were supposed to attend each of the planets, and to direct their motions.

The most illustrious astronomer which had as yet appeared at Alexandria, is now to be named; this was **HIPPARCHUS**, who flourished between 160 and 125 years before the Christian era. He first brought this science into a tangible elementary form, rendering it systematic. He discovered, or was the first who observed, the difference between the autumnal and the vernal equinox; the former being seven days longer than the latter, which proceeds from the eccentricity of the earth's orbit, first discovered from observing the inequality of the solar motion. He framed tables for what is called the *equation of time*, or to ascertain the difference between the shade on a well-constructed dial and a perfectly regulated clock. He made great progress in explaining the motions and phases of the moon: however, he was not so successful with respect to the planets.

His greatest work was his ascertaining the number of the stars, marking their distances, and arriving at the means by which their precise places on the hemisphere of Alexandria could be known; he marked 1600 stars, in seventy-two signs, into which the heavens were divided, *Pliny*, ii. 41. Pliny says this was a labour which must have been difficult even to a god.—*Ausus rem etiam Deo improbam*, *Ibid.* ii. 26.

The appearance of a new star induced him to set about and accomplish this work, which he did in a catalogue, for the benefit of future observers.

Hipparchus does not mention comets; whence it has been conjectured he had never seen any: it has been also suggested, that he considered them with meteors, which are not objects of astronomical observation. He divided the heavens into forty-nine constellations: *i. e.* twelve in the ecliptic, twenty-one in the north, and sixteen in the south. To one of these he gave the name of *Berenice's Hair*, in honour of

the wife of *Ptolemy Soter*, who had consecrated her hair, which was very beautiful, to Venus *Urania*, if her husband should return from a war in Asia victorious ; it being hung up in the temple of the goddess, soon after disappeared, and is said to have been carried off by the gods. However, *Catullus*, *Ep. 64*, makes Conon author of the name of that constellation.

Hipparchus likewise constructed a sphere, or celestial globe, on which all the stars visible at Alexandria were depicted; and thought to have been similar to the *Farane* globe at Rome, still extant. In his observations on the stars; he discovered that when viewed from the same spot, their distances always appeared the same from each other: but he perceived the distance of the moon to be different in various parts of the heavens; for instance, in the horizon and zenith. This he conceived to be owing to the extent of the globe; he, therefore, contrived a method of reducing appearances of this kind, to what they would be, if viewed from the centre of the earth, which is called a *parallax*; and the discovery of it was of the greatest importance to astronomy. He took this idea from observing that a tree in the middle of a plain, appeared in different parts of the horizon, when viewed from different situations; so does a star appear in various points of the heavens, when viewed in different parts of the globe. *Hipparchus* was the first who connected geography with astronomy, and thus fixed both these sciences on certain principles.

Although it is alleged that no astronomer of eminence appeared at Alexandria between *Hipparchus* and *Ptolemy*, yet some say that *Geminus* appeared in that period, who wrote a commentary on *Aratus*, and was the first who treated astronomy in a methodical or elementary manner.

At Rome, towards the end of the republic, astronomy was taught by several philosophers, particularly by *Posidonius*, the Stoic, a native of *Ampamæ*, in Syria, scholar of *Panetius*, and the friend of *Cicero* and *Pompey*. He commonly resided at *Rhodes*, *Cic. Att. ii. 1.*; *Tusc. ii. 26.*; where he attempted next after *Eratosthenes* to measure the earth: he constructed a very ingenious moveable sphere. *Cic. Tusc. v. 37.*; *Nat. D. ii. 34.* He thought the stars were formed of ethereal fire, and animated bodies, always moving in circles. He attributed the extraordinary bulk of the sun and moon, when near the horizon, to the vapours of the atmosphere, which, breaking the rays and turning them from their direct line, amplified the magnitude of those objects (*Strabo*, *iii. 158.*) which we call *refraction*. He

explained the tides from the motion of the moon, *Ibid.* 137; alleged that the height of the atmosphere was 400 *stadia*, nearly the same as what the moderns reckon it, *Plin.* ii. 21, § 23. He thought from the region of the clouds to the moon was 2,000,000 of stadia, and from the moon to the sun 500,000,000 of stadia. *Ibid.* *Cleomed.* ii. 4. *Strabo*, *ibid.* *Posidonius* was a stoic in practice as well as principle. *Cic.* *Tusc.* ii. 25. We owe his opinions to *Cleomedes*, who lived after him. In his book on the theory of celestial bodies, he alleges, that the earth seen from the sun would appear only like a point; but from the stars it would not be visible: whence he concludes that the stars are much larger than the earth.

The science of astronomy appears to have been studied at Rome in an early period; for *Sulpitius Gallus* foretold an eclipse, which happened in the night before the battle in which *Perseus*, king of Macedonia, was defeated by *Paulus Æmilius*: by warning the soldiers that such an event was to happen, prevented their being frightened; and thus contributed to the victory. *Liv.* xliv. 37. *Plin.* ii. 12.

But the person who, among the Romans, most contributed to the advancement of astronomy, was **JULIUS CÆSAR**, not only by the reformation of the Roman Calendar, but also by his knowledge of the principles of that science. Hence he is extolled by *Lucan*, x. 184.

VARRO was the first who made use of *eclipses to regulate chronology*. *Censorin.* *de die Nat.* 2. He is said, in his book *de Astrologia*, to have likened the figure of the earth to an egg. *Cassander*, and others, according to *Pliny*, resemble it to a pine-nut, ii. 55. *Seneca* compared it to a ball. *Nat.* 2. iv. 11.

Under Augustus flourished **HYGINUS**, who wrote a description of the constellations; **MANILIUS**, who wrote a poem, containing an account of ancient astronomy and astrology, called *Astronomicen*. **GERMANICUS CÆSAR**, who translated *Aratus*; and **VITRUVIUS**, who has preserved to us much valuable information concerning astronomy. Among those names, that of **LUCRETIUS** should be respectfully remembered. **SENECA**, in his natural questions, has many curious and useful observations on this subject, particularly concerning comets. But the Romans, in general, paid little attention to astronomy, and the sciences connected therewith. Astrology, though ridiculed by their philosophers, *Cic.* *Divin.* ii. 42; *Geminus*, in *Uranologion*, 14, had more credit with the people. The most illustrious astronomer and geographer of the Alexandrian school was **PTOLEMY**, born at *Ptolemais*, in Egypt; he flourished under

Adrian and the Antonines. His works, particularly that called the great *Syntaxis*; by the Arabs, **ALMAGISTUM**, or the *Grand Composition*, served for many ages as a directory to such who applied to astronomical studies. He supposed the earth to be in the centre, and the heavenly bodies to move round it. The diversity of their motions he ingeniously explained by cycles and epicycles,—but in a manner not easy to be understood.

The school of *Alexandria* subsisted for about 500 years after Ptolemy, till that city was taken by the Arabs, and its famous library destroyed, anno Christi 642. Amrou, the general of the Arabs, being requested by one *John*, surnamed the Grammian, (called by some *Philoponus*,) but *John*, according to the Arabic historian, *Abulpharagius*, to give it him, as he had appeared not to have taken any account of it; Amrou wrote to the Caliph *Omar* for directions; the general received for answer,—“ *What is contained in those books you mention, is either agreeable to what is written in the book of God, (meaning the Koran,) or it is not: if it be, then the Koran is sufficient without them; if otherwise, 'tis fit they should be destroyed.*” Amrou, agreeably to the Caliph's command, distributed the books throughout all the city, among those who kept warm baths (of which there were, at that time in *Alexandria*, no fewer than 4000) to heat the baths with. And, notwithstanding the great havoc that must needs be made of them, at this rate, the number of books which the diligence of former princes had collected was so great, that it was six months before they were all consumed! But the Arabs in less than a century after they had burnt the library, and dispersed the learned men of *Alexandria*, began to have a taste for literature, and lamented the loss of what their fathers had destroyed. They collected with care the MSS. which had escaped the flames and their barbarity. During the reigns of *Almanzor*, *Haroun Alraschid*, and his son *Almamon*,—Bagdad, their capital city, became the seat of learning, as *Alexandria* had been under the Ptolemies. It is recorded, to the honour of **ALMAMON**, that in granting peace to *Michael III.* Emperor of Constantinople, he made it an express condition that he should have liberty to collect all the books on philosophy, which could be found in *Greece*, that he might have them translated into Arabic.

Thus the Arabs rather merit praise for having preserved the light of knowledge, than for having improved it. They transmitted the sciences nearly as they had received them, without making any memorable discovery. However, that

kind of mathematics, called ALGEBRA, in which numbers, lines, and quantities, are expressed by signs and symbols, commonly by letters, was derived from the Arabs, who are supposed to have learnt it from the Persians, as they are presumed to have had it from the Indians: also the common numerals, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, (the first nine called *digits*, and the last *zero*, or a *cypher*,) are said to have come from Arabia; but, we think, we have authority to prove that we obtained them from the *Phœnicians*.

Astronomy, and particularly astrology, have been long, and still are held in great estimation among the *Persians*. Those sciences were formerly much cultivated also by the Tartars. The descendants of *Zingis-Khan* and *Tamerlane*, invited to their courts such who were distinguished for this kind of knowledge; furnished them with instruments, and supported them with royal munificence.

But the Indians and Chinese are said to have been most remarkable for their discoveries in these sciences: what is more strange, they have been said to have known for ages, the most celebrated inventions of Europeans, Asiatics, and Africans, in these sciences; and, still more wonderful, that they with the Mexicans name the several planets by the same denominations by which they are known to Europeans!

The barbarous nations of Europe, particularly the Druids, in Britain and Gaul, are said to have been well informed in these sciences, *Cæs. B. G.* vi. 14; which will not be surprising, admitting the opinion of the antiquary of India be established, “that the British Druids were a colony of the “*Assyrian magi*.”—*Maurice’s Dissertation on Babylon*.

After the overthrow of the Roman empire, the first encourager of learning was CHARLES THE GREAT, or *Charlemagne*: but little could be done in his time; after his death, the former ignorance prevailed. BEDA, or *Bede*, from his piety and modesty termed *venerabilis*, and his scholar, ALCINIUS, both *Englishmen*, greatly excelled in general literature; among other qualifications, they were eminent in the astronomy of the preceding period. The first step towards the revival of knowledge, was the translation of the Astronomical Elements of ALFERGAN, the Arab, by order of FREDERICK II. chosen Emperor of Germany in 1212. About the same time, ALPHONSO X. King of Castile, assembled from all parts the most famous astronomers, who, at his desire, composed what are called the *Alphonsine Tables*, founded on the hypothesis of Ptolemy.

About the same period, JOHN SACROBOSCO, of HOLYWOOD, a native of Halifax, in Yorkshire, who was educated

at Oxford, and taught mathematics and philosophy at Paris, made an abridgement of the *Amalmagest* of Ptolemy, and of the commentaries of the Arabs, which was long famous as an elementary book, under the title of *De Sphera Mundi*. He died at Paris, anno 1235. In the same year, ROGER BACON, an English Franciscan friar, made astonishing discoveries in science for the time in which he lived. He perceived the error in the *Kalendar* of Julius Cæsar, and proposed a plan for the correction of it to Pope Clement IV. anno 1267. He is presumed, from his writings, to have known the use of optical glasses, and the composition and effect of gunpowder. He believed in planetary influence on men's fortunes, and the transmutation of metals. On account of his vast knowledge in astronomy, mathematics, and chymistry, he was called *Doctor Mirabilis*; but, for the same reason, he was suspected of magic. Under this pretext, whilst at Paris, he was put in prison by order of the Pope's legate: after a long and severe confinement, he was, at last, by the interest of several noble persons liberated, returned to England, and died at Oxford, anno 1292, *atat. 78.*

In the fifteenth century, two events happened which changed the face of the sciences; the invention of printing, about 1440, and the taking of Constantinople by the Turks, in 1453. The learned men of that city having escaped from the cruelty of the victors, fled into Italy, and again introduced the taste for classical literature; which was greatly promoted by the munificence of the Emperor FREDERICK III. Pope Nicholas V. and particularly of COSMO DE MEDICI, who justly merited the title of *Father of his Country, and Patron of the Muses*. The most distinguished Greeks who fled from Constantinople, were *George of Trebizon*, *Demetrius, Chalcondylus, Theodore Gaza, John Agyrophilus, John and Constantine Lascaris*, and the famous Cardinal *Bessarion*.

The restoration of astronomy began in Germany. The first who distinguished himself was GEORGE PURBACH, born at Purbach, a village on the confines of Austria and Bavaria, in 1423, who was cut off in the flower of his age, only thirty-eight years old. He was succeeded by a scholar more skilful than himself, JOHN MULLER, born at *Koningsberg*, in 1436, called, from the Latin of that place, *Regiomontanus*, who taught mathematics and astronomy with great reputation at Vienna. In February, 1471, appeared a comet, on which he published his observations. Being called to Rome by Pope Sextus IV. to assist in

correcting the kalendar, he was cut off by the plague, in 1476. BERNARD WALTHERUS, a rich citizen of Nuremberg, his friend and associate, succeeded him, who is said to have first made use of *clocks*, in his astronomical observations, in 1484, and to have been the first of the moderns who perceived the effects of the refraction of light.

FRACASTORIUS, born at *Verona*, in 1483, was a celebrated astronomer, and an eminent poet and good philosopher; he made considerable discoveries in this science, and with all his abilities, may be considered as the precursor of the celebrated Copernicus.

NICHOLAS COPERNICUS, the restorer of the Pythagorean philosophy, and the modern discoverer of the rational and true system of astronomy, as now universally received, under the title of his name, was born at *Thorn*, a city of Royal Prussia, 19th February, 1473. Having learnt the Latin and Greek languages in his father's house, he was sent to *Cracow*, to be instructed in philosophy and physic, where he was honoured with the degree of *doctor*; showing a greater predilection for mathematics than medicine. His uncle by his mother's side was a bishop, who gave him a canonry upon his return from Italy, whither he had gone to study astronomy under *Dominic Maria*, at Bologna, and had afterwards taught mathematics with success at Rome. In the repose and solitude of an ecclesiastical life, he bent his chief attention to the study of astronomy. Dissatisfied with the system of Ptolemy, which had prevailed fourteen centuries, he laboured to form a juster one. What led him to discover the mistakes of Ptolemy was his observations on the motion of Venus: he is said to have derived his first notion on this subject from certain passages in the classics, which mention the opinions of Pythagoras and his followers, particularly *Cicero*, *Acad.* iv. *Plutarch*, *Vitæ Numæ*, and *Placit. Philosop.* as, indeed, he himself acknowledges in his address to Pope Paul III. He established the rotation of the earth round its axis, and its motion round the sun; but to explain certain irregularities in the motion of the planets, he retained the epicycles and eccentricities of Ptolemy. His work was first printed at Nuremberg, in 1543, a short time before his death.

The doctrine of Copernicus was not at first generally adopted. The most eminent professors in Europe adhered to the old opinions.

Among the astronomers of this period, the LANDGRAVE

OF HESSE, deserves particular praise, who erected a magnificent observatory at the top of the castle of Cassel, and made many observations himself, in conjunction with *Christopher Rothman* and *Justus Burge*, concerning the place of the sun, of the planets, and stars.

But the person who enriched astronomy with the greatest number of facts of any modern who had yet appeared was **TYCHO BRAHE**, a Dane of noble extraction, born in 1546, designed by his parents for the study of the law; but attracted by an eclipse of the sun, in 1560, at *Copenhagen*, whither he had been sent to learn philosophy, he was struck with astonishment in observing that the phœnomenon happened at the very moment it had been predicted.

He admired the art of predicting eclipses, and wished to acquire it. At first, for want of proper instruments, he fell into several mistakes, which, however, he afterwards corrected. Having early perceived his future improvements must depend on instruments, he caused some to be constructed larger than usual, and thus rendered more exact. *On the 11th November, 1572*, before supper, *he perceived a new star in Cassiopœia*, which continued without changing its place till spring, 1574, equal in splendour to Jupiter or Venus. At last it changed colours, and entirely disappeared. Nothing similar to this had been observed since the days of Hipparchus.

Tycho, in imitation of that illustrious astronomer, conceived the design of forming a catalogue of the stars. To promote his views, the King of Denmark ordered a castle to be built in *Huen*, an island between *Seonia* and *Zealand*, which Tycho called *Uranibourg*, “*the city of Heaven*,” and where he placed the finest collection of instruments that had ever yet appeared; most of them invented or else improved by himself. He composed a catalogue of 777 stars, with greater exactness than had ever been done before; and constructed tables for finding the place of the most remarkable stars at any given time. He was the first who *determined the effect of REFRACTION*, whereby we see the sun or any star above the horizon, before it is so in reality; as we see the bottom of a vessel when filled with water, standing at a distance, which we could not see when empty. He made several other improvements and important discoveries, which he published in a work intituled *Progymnasmata*. The labours of Tycho attracted the attention of Europe: the learned went to consult him, and the noble to see him. James VI. of Scotland, when he went to espouse

the sister of Frederick, King of Denmark, paid Tycho a visit with all his retinue, and wrote some Latin verses in his praise.

But these honours were of short continuance: after the death of his protector, King Frederick, the pension assigned him was retrenched, and he was obliged to banish himself his native country. Having hired a ship, he transported his furniture, books, and instruments to a small place near Hamburgh, in 1597. The Emperor Rodolphus invited him into his dominions, settled a large pension on him, gave him a castle near Prague, to prosecute his discoveries, and appointed him *Longomatus*, a native of Jutland, and the celebrated *Kepler* to assist him. But Tycho was not happy in his new situation;—he died 14th October, 1601, repeating several times, “ *I have not lived in vain.*”

Tycho adopted neither the system of Ptolemy or Copernicus: he supposed the earth at rest, and the sun and moon to move round it; but the other planets to move round the sun. This opinion however had but few followers.

Tycho is said to have been influenced in his opinion in the formation of his system, by the consideration that it might not affect the Scriptures, for he was very religious. He was a firm believer in astrology, which prevailed greatly in that and the following age, when the predictions of astrologers, from natural appearances, often produced the most serious alarms. Kings and great men used to keep astrologers in pay. By act of parliament of the 23d of Elizabeth, it was made felony to cast the nativity of the Queen, or by calculation to seek to know how long she should live. It was only in the last century that the light of knowledge banished this credulity, and the superstitious belief in apparitions, witches, &c.

KEPLER was one of the greatest philosophers that ever lived, and ought justly to be considered as the discoverer of the *true* system of the world. He was born in Germany, at *Wiel*, near *Wirtemburg*, 27th December, 1571. He early imbibed the principles of *Copernicus*, from his master *Mæstilin*. After the death of *Tycho*, he was employed to finish the tables which *Tycho* had began to compose from his observations. Kepler took twenty years to finish them. He dedicated them to the Emperor, under the title of the *Rodolphine Tables*.

Kepler united optics with astronomy, and thus made the most important discoveries. He was the *first* who discovered that the *planets move not in a circle, but in an ellipse*;

and that although they move sometimes faster and sometimes slower, yet that they describe equal areas in equal times; that is, that the spaces, through which they move in different parts of their orbit, *are* of equal times, though of unequal length; yet when two straight lines are drawn from the extremity of either space to the centre of the sun, *they form triangles which include equal areas*. He likewise demonstrated that the squares of the periodical times of the revolution of the planets round the sun, are in proportion to the cubes of their distance from him; a theorem of the greatest use in astronomical calculations: for, having the periodical times of two planets given, and if the distance of one of them be known, by the rule of proportion the distance of the other can be ascertained.

Kepler is said to have used logarithms in framing his Rhodolphine Tables. This great man died in poverty, 15th November, 1631, at Ratisbon, whither he had gone to solicit the arrears of his pension, which had been very ill paid: he left nothing to his wife and children but the remembrance of his virtues.

Contemporary with Kepler was GALILEO, born at *Pisa*, in Italy, in 1564, illustrious for his improvements in mechanics, for his explication of the effects of gravity, and for the invention, or at least the *improvement* of telescopes.

The use of spectacles, or reading-glasses, (convex for long-sighted, and concave for short-sighted persons,) had been invented by one *Spina*, a monk of *Pisa*, in 1290; or, as others say, by our countryman, *Roger Bacon*. The use of telescopes or glasses for viewing objects at a distance, was first invented by *Zachary Janssen*, a spectacle-maker at *Middleburg*, or rather, as it is said, from the *accidental discovery of a child*. The honour of this invention is also ascribed to others. It is certain that *Galileo* first improved them so as to answer astronomical purposes. He also first made use of the single pendulum for measuring time, in making his observations; to which he was led, by considering one day, *the vibrations of a lamp, suspended from the vaulted roof of a church*. He likewise discovered the gravity of the atmosphere from the rising of water in a pump, by the action of a piston, which led the way to the invention of the barometer, by his scholar *Toricelli*.

The use of telescopes opened, in a manner, a new world to *Galileo*. He observed with astonishment the increased magnitude and splendour of the planets, and their satellites, formerly invisible; which afforded additional proofs of the

veracity of the Copernican system, particularly the satellites of Jupiter and the phases of Venus. He discovered an innumerable multitude of fixed stars, which the naked eye could not discern, and what greatly excited his wonder, without the least increase in their size or brightness.

About the same time, JOHN NAPIER, baron of *Merchiston*, in Scotland, invented what are called LOGARITHMS, first published at Edinburgh, in 1614, afterwards improved by Mr. *Briggs*, professor of geometry at Oxford, in which, by a very ingenious contrivance, addition is made to answer for multiplication, and subtraction for division; an invention of the greatest utility in astronomical calculations.

Galileo was not afflicted with poverty, but with persecution. At seventy years of age he was called before the Inquisition, for supporting opinions contrary to Scripture,—and was obliged formally to abjure them, 11th June, 1633, to avoid being burnt as an heretic. The system of *Copernicus* had yet gained but few converts; and the bulk of professors and learned men in Europe, attached to the philosophy of *Aristotle*, supported the old doctrine. *Galileo* was condemned to prison, and confined to the small city *Arcetti*, or *Arcem*, with its territory, where he consoled himself by the study of astronomy. He contrived a method of discovering the longitude, by the satellites of Jupiter, which, however, has not been productive of all the advantages he expected. He died in prison, or rather exile, in 1642.

Although there were a great number of astronomers contemporary with *Kepler* and *Galileo*, none made any conspicuous figure. *John Bayer*, of Ausbourg, introduced the Jewish method of marking the stars with letters of the Greek and Latin alphabets: this the Jews use because their law does not permit the use of figures, the produce of fancy.

In 1732, astronomers were very attentive to observe the transit of Venus over the disc of the sun, which *Kepler* had predicted, as a confirmation of the system of *Copernicus*. Mercury was observed by *Gassendi*, in France, and some others; but the transit of Venus did not then take place for their inspection.

The transit of Venus was first seen by JEREMIAH HORROX, of *Hoole*, an obscure village fifteen miles north of Liverpool, on the 24th of November, 1639, and at the same time by his friend, *William Crabtree*, at Manchester. Horrox was born 1619, and died 1641, in the twenty-third

year of his age. He wrote an account of his observations, which were published after his death, under the title of “*Venus in Sole visa*,” by *Hevelius*; and his other writings by *Flamstead* and *Wallis*, in the *Philosophical Transactions*, 1675.

The Copernican system was first publicly defended in England, by Dr. *Wilkins*, 1660; in France, by *GASSENDI*, the son of a peasant in Provence, who published many valuable works on philosophy. He was born 1592, and died in 1655. He was violently opposed by *Morin*, a famous astrologer.

DESCARTES, descended from a noble family, the son of a counsellor of *Brittany*, in *France*, born at *Haye*, in *Tourraine*, 31st March, 1596, early distinguished himself by his knowledge in algebra and geometry. He attacked and overturned the philosophy of *Aristotle*, in his own country. He attempted to establish certain principles, which, though founded in theory, he took for granted, by which he accounted for all appearances. Like *Mochus* and *Democritus*,² he imagined all space to be filled with corpuscles or atoms, in continual agitation, and denied *the possibility of a vacuum*. He explained every thing by supposing *vortices*, or motions round a centre, according to the opinion of *Democritus*, *Diog. Laert.* ix. 31 and 44, and thus discovered the centrifugal force, in the circular motion of the planets. But the system of *Descartes*, not being founded on facts or experiments, did not subsist long; although at first it had many followers. His astronomical opinions were much the same with those of *Copernicus*.

Although the lively notions of *Descartes* led him into error, yet his exalted views greatly contributed to the improvement of science. Men were led to observation and experiments, in order to overturn his system, and astronomy was cultivated by persons of ability, *i.e.* *Bouillard*, at Paris; *Ward*, at Oxford, 1653; and by *HEVELIUS*, at Dantzic, from 1643, who constructed a fine observatory, and collected a great many facts by his long assiduous observation, for fifty years, during which he made many discoveries concerning the planets, fixed stars, and particularly comets. *Colbert*, in the name of Louis XIV. sent him a sum of money, and a pension. *Hevelius* published a catalogue of fixed stars, intituled *Firmamentum*

² *Diog. Laert.* ix. 44.

Sobieskianum, dedicated to John Sobieski, King of Poland, at that time justly famous for having raised the siege of Vienna, when attacked by the Turks, in 1683. In honour of whom Hevelius formed a new constellation, between *Antinous* and *Serpentarius*, called *Sobieski's Shield*.

But the most distinguished astronomer of that time was CHRISTIAN HUYGENS, Lord of Zuilichem, son to the secretary of the Prince of Orange, born at the Hague, 14th of April, 1629, and educated at Leyden, under SCHOOTEN, the commentator on Descartes,—famous for the application of *pendulums to clocks and springs to watches*, for the improvement of telescopes and microscopes, and for the great discoveries he made, in consequence of these improvements, in astronomy.

The establishment of academies, or societies, at this time, contributed greatly to the advancement of science.

The Royal Society in *London* was begun in 1659, but did not assume a regular form till 1662. Its transactions were first published in 1665. The Academy of Sciences at *Paris*, was founded in 1666, by Louis XIV. who invited to it *Roemer* from Denmark, *Huygens* from Holland, and *Cassini* from Italy.

CASSINI was born at *Perinaldo*, in the county of Nice, 8th June, 1625, and was appointed first professor in the royal observatory at Paris, where he prosecuted his discoveries till his death, in 1712, and was succeeded by his son. He was assisted by *Picard*, *Auzoul*, and *La Hire*.

By the direction of the Academy of Sciences, at Paris, a voyage was undertaken by *Richer* and *Meurisse*, at the King's expense, to the island of *Caïenne*, in South America, almost under the equator, in 1672, to ascertain several philosophical facts;—the refraction of light, the parallax of Mars, and of the Sun, the distance of the tropics, the variation in the motion of the pendulum, &c.

The parallax of the sun is the angle under which an observer at the sun would see the earth: this Cassini fixed at $9\frac{1}{2}$ seconds, and the angle under which we see the sun, at 16 minutes and 6 seconds, or 966 seconds; hence he concluded that these semi-diameters, are as $9\frac{1}{2}$ to 966, or as 19 to 1932. So that, according to Cassini, the semi-diameter of the earth is one hundred times less than that of the sun; and, consequently, the sun is a million times larger than the earth.

The parallax of the sun has since, from the transit of

Venus, 6th of June, 1761, and 3d of June, 1769, been discovered to be but about 8 seconds, consequently his comparative bulk to that of the earth, and his distance from it, to be proportionably greater. This method of finding the distance of the earth from the sun, and consequently of the other planets, was first proposed by Dr. HALLEY, who had never seen, and was morally certain, he never should see this appearance.

Meurisse died in his voyage. *Richer* returned in 1676. His answer to the parallax of Mars was not satisfactory. *Cassini* calculated it at fifteen seconds.

The distance of the tropics was found to be $46^{\circ} 57' 4''$. The chief advantage resulting from the voyage was, ascertaining the vibration of the pendulum. In 1669, *Placard* remarked that clocks went slower in summer than in winter, owing to, as since ascertained, that it is the property of heat to dilate bodies, which consequently lengthens the pendulum; that cold produces an opposite effect. *Richer* found that the pendulum made forty-eight vibrations less at Caïenne than at Paris; that it went two minutes and twenty seconds a day slower; hence to adjust he was obliged to shorten the pendulum.

The same fact was confirmed by HALLEY, while at St. Helena, in 1676. But an additional reason for this variation, is presumed to exist, from the machine being farther removed from the central axis of the earth; the gravitating principle is presumed to be diminished at the equator, more than it is when nearer the poles.

About this time the French Jesuit Missionaries having got admission into *China*, contributed greatly to the improvement of their astronomy. Father SCHAAL, one of their number, on account of his merit, and particularly for his skill in astronomy, was so highly honoured by the court of *China*, that the Emperor, upon his death-bed, made him preceptor to his son and successor, *Can-Hi*. Schaal, reformed the Chinese Kalendar, a matter of great importance to that country. It was further improved by VERBIEST, who succeeded Schaal about the year 1670. The most eminent astronomers in England during this period were *Flamstead*, *Halley*, and *Hook*.

FLAMSTEAD was born at Derby, August 19, 1656. He composed a new catalogue of the fixed stars, containing about 3000. He made his observations first in private, and afterwards in the Royal Observatory at Greenwich, founded in 1675. He died in 1719.

Revering the merits of the illustrious dead, we must pay our sincere respect to the memory of a character eminent for universal science, in the person of **Dr. EDMUND HALLEY**, who was born at Haggerston, near Kingsland, in the vicinity of London, anno 1656. He was educated at St. Paul's school, under the care of the learned Dr. Thomas Gale, where he distinguished himself by his classical attainments, and particularly by the advances he made in mathematical learning. In 1673, he was entered a Gentleman Commoner of Queen's College, Oxon; where he applied himself with all that zeal which distinguishes a great mind, susceptible of the loveliness of scientific truth, to the studies of that university, but more particularly to mathematics and astronomy. Of his skill in the latter, he exhibited a striking proof when he was only nineteen years of age, by communicating to the world his “*Direct and Geometrical Method of finding the Aphelia and Eccentricity of Planets;*” having previously assisted Flamstead in composing his catalogue of stars. In the month of June, 1675, he made some curious observations on the eclipse of the moon; and in the following year he communicated certain discoveries respecting a spot in the sun, by which the rotation of that body on its axis was fully ascertained. About the same period, he observed an occultation of Mars by the moon, which he afterwards applied, with others, in fixing the longitude of the Cape of Good Hope. He made some notable observations on the transit of Mercury; paid great attention to the motions of Jupiter and Saturn, and by his observations was enabled to correct the best astronomical tables extant. Judging, that to form a correct scheme of the heavens, the addition of the stars in the southern hemisphere must be made, and to obtain a knowledge of the stars near the south pole, he made a voyage to St. Helena, where he composed a catalogue of such stars which do not rise above the horizon north of the Equator. These he formed into constellations, (to one of which he gave the name of *The Royal Oak*, in memory of the tree which sheltered Charles II. when he fled from his pursuers,) and perfected his catalogue. Upon his return, he was presented to King Charles the Second, who gave him a mandamus to the University of Oxford, for the Master of Arts degree. About the same time, he was elected a Fellow of the Royal Society; and in 1679, he went to Dantzic, to confer with Hevelius about the dispute between him and Dr. Hook, respecting the preference of plain or glass sights in astro-

nomical instruments. He arrived at that city in May, and immediately entered upon some observations with the learned Pole; which were closely continued till the middle of July, when he returned to England. Before he left Dantzic, he gave the strongest testimonies of his candour, by writing to Hevelius, acknowledging the surprising accuracy of his observations, and voluntarily offering himself as a witness to the incredible perfection of his instruments, against any person who should call that matter in question. In 1680, appeared the great comet, which Mr. Halley first observed in his passage from Dover to Calais. He afterwards completed his observations upon it at the Royal Observatory. From thence he went to Italy, with his friend and school-fellow, Mr. Nelson; in their journey, he had a second view of the comet, as it appeared in its return from the sun. So highly were Mr. Halley's talents appreciated by Newton, that he committed to his care, in 1686, the publication of the "Principia;" to which the former prefixed a copy of verses. He had previously to this, turned his thoughts to the subject of Kepler's problem; and after maturely weighing the subject in his mind, came to the resolution that *the centripetal force must decrease in the inverse proportion of the squares of the distances.* To show the trouble he took to arrive at this demonstration, he first consulted Sir Christopher Wren, and afterwards Mr. Newton, by whom all his difficulties were resolved. About this time he published the history and physical cause of the trade-winds and monsoons, together with a chart, representing their direction, &c. In 1687, he undertook to explain the cause of a natural phenomenon, that had till then baffled the researches of scientific men. It had been observed that the Mediterranean is never affected by tides in the same manner that other seas, and parts of the ocean are, although there is no visible discharge of the prodigious quantities of water that run into it from nine large rivers, and other inferior streams, and also from the constant setting in of the current at the Straits of Gibraltar. This he showed, by a great variety of experiments, is occasioned by evaporation caused by the sun and wind. The circulation he supposed was carried on by winds driving those vapours to the mountains, where, being collected, they form springs; the streams from which, reuniting, become rivulets; many of these meeting in the valleys, they form rivers, which at length empty themselves into the sea. Hence, there is an equilibrium between the expenditure and the

receipt of the ocean. Mr. Halley's was a most active life, his pursuits at this period are mentioned with enthusiastic applause by the French eulogist, M. Mairan: after noticing his paper on the Winds, and on Gunnery, which had been read before the Royal Society, he says " Soon after he be-
" came the Assistant Secretary to that learned body, these
" were followed by questions on the nature of light;
" transparent bodies; a determination of the degree of mor-
" tality, in order to adjust the valuation of annuities on lives;
" and many other works in almost all sciences: *i. e.* astro-
" nomy, geometry, algebra, optics, dioptricks, ballistics, and
" artillery; speculative and experimental philosophy; na-
" tural history, antiquities, physiology, and criticism; be-
" ing about from twenty-five to thirty dissertations; which
" he produced during about ten years' residence in London;
" all abounding with ideas new, singular, and useful." In
1692, Mr. Halley resigned his office of Assistant Secretary
to the Royal Society; and in 1696, on the establishment
of five different mints for the recoinage of silver specie, he
was constituted comptroller of the office at Chester. In
1701, he published a " General Chart, showing at one view
" the Variations of the Compass in all those Seas with
" which English Navigators are acquainted." This val-
uable work was the result of actual observation, for which he
traversed the vast ocean in both hemispheres: in one voyage,
he went as far south till the ice prevented his progress; on
his return he touched at St. Helena, the Brazils, Barba-
does, Cape Verd, Madeira, the Canaries, and the coast of
Barbary. This chart laid down a foundation for the dis-
coveries of the law by which the variation is regulated in all
parts of the world. After this, he was employed by the
King to observe the course of the tides, with the longitude
and latitude of the principal headlands round the British
coast. In 1702, he was sent by Queen Anne to take a
survey of the Ports of Dalmatia, with a view of forming a safe
and convenient harbour for shipping in the Austrian territo-
ries, on the Adriatic. Halley, being introduced to the Em-
peror, gave him an account of two harbours on the Istrian
coast; who in return presented him with a valuable diamond
ring, taken off his own finger; also a letter, written in his own
hand, strongly recommending him to the Queen. In 1703, he
was appointed Savilian Professor of Geometry, at Oxford,
in the room of Dr. Wallis deceased; on this occasion, he
was honoured by the University with the degree of LL.D.
He now undertook and completed a translation from Arabic

into Latin of *Apollonius de sectione Rationis*, which had been begun by Dr. Edward Bernard. Next, in conjunction with Dr. Gregory, he set about preparing for the press, “*Apollonius's Conics*; to this was added, “*Serenus on the Section of the Cylinder and Cone.*” In 1708, he published his “*Miscellanea Curiosa*,” in 3 vols. 8vo. In 1713, he succeeded to the office of Secretary to the Royal Society; and in 1719, he was, upon the death of Mr. Flamstead, made Astronomer Royal, by King George the First. At Greenwich, he exerted all his well-informed powers for eighteen years, in contemplating the theory of the moon's motion, and in other stellar observations, with various scientific objects connected therewith; constantly employing the closest attention, insomuch so, that he scarcely ever missed a meridian view in favourable weather: and during that period, performed the entire business of that observatory, without the aid of an assistant. In 1729, he was admitted a foreign member of the Academy of Sciences at Paris. He died at the very advanced age of eighty-six, whilst sitting in his chair, and expired without a groan. Such was the end of the man of virtue and science, after a laborious life, entirely consumed in its service, and devoted to its pursuit in every part of the world, as we have seen. None more merited the very favourable attention that he enjoyed from the muse of the coelestial science, for none were better qualified for her divine favours, for none sought them more unremittingly, or were more steady in their fervent pursuit.

He possessed every qualification necessary for the astronomer, naturalist, scholar, and philosopher; always communicative, totally disinterested, liberal, frank, and sincere. His qualifications, though profound, did not render him austere, morose, or sour, in disposition; but, on the contrary, his conversation was enlivened with a vein of gaiety: which happy disposition of mind, must have arisen from a life of conscious virtue, and a conviction that the powers and faculties of his mind were directed to their grand ultimate object. He was author of other works besides those previously mentioned, as “*Astronomical Tables, with precepts for computing the Places of the Sun, most of the Planets, and Comets;*”—“*A Synopsis of the Anatomy of Comets,*” annexed to Dr. Gregory's Elements of Astronomy; and a great number of valuable papers in the Philosophical Transactions.

HOOK invented several astronomical instruments; he was

of great service to Mr. *Boyle*, in completing his improvement of *Guericke's* invention of the air-pump. Being appointed one of the surveyors for re-building London, he acquired a large fortune. He published several curious experiments which he had made, to explain the motion of the earth and planets, on the principles afterwards adopted by *Newton*. He died in 1702.

Sir ISAAC NEWTON was born at Woolstrop, in Lincoln, December 25, 1642: after due preparation, he was admitted a student in the University of Cambridge. The rapidity of his progress in mathematical knowledge, was truly astonishing. He is said to have perceived the theory and problems of *Euclid*, as it were, by intuition. At the age of twenty-four, he had laid the foundation of the most important mathematical discoveries. He is the first who gave a rational and complete account of the laws which regulate planetary motion, on the principles of the attraction of gravitation, now almost universally adopted. He is said to have been led into his speculations on gravitation, as he sat alone in a garden, from observing the falling of some apples. Newton was as remarkable for a modest diffidence of his own abilities, as for the superiority of his genius. With much difficulty he was prevailed upon, by the solicitations of *Halley*, to publish his *Principia*, or *Mathematical Principles of Natural Philosophy*, in 1686; a work which was considered as the production of a superior intelligence. In 1704, he published his *Optics*; in 1711, his *Fluxions*, a new mode of arithmetical calculation, of great use in the superior branches of mathematics, the invention of which is however disputed with him by *Leibnitz*, the famous German philosopher: and in 1728, his *Chronology*, which he endeavoured to adjust by calculating the period of eclipses. He received in his life-time the honour due to his singular merit. In 1703, he was elected President of the Royal Society. In 1705, he received the honour of knighthood, by Queen Anne. He was twice Member of Parliament. In 1669, he was made Master of the Mint: which, with the presidency of the Royal Society, he held till his death, in 1726. His funeral was celebrated with great magnificence; the Chancellor and five other Peers supporting his pall: he was buried in Westminster Abbey, where is a very appropriate monument to his memory.

The principles of *Newton* were illustrated and confirmed in France by *Giraldi*, *Cassini*, *La Hire*, *De Lisle*, *Lourritte*, *M. de la Lande*, *Maupertius*, *Marian*, *M. de la Caille*, &c. In Britain, by *Flamstead*, *Halley*, *Whiston*, *Gregory*, *Des*

Aiguilliers, Molyneux, Bradley Kiel, Mercator, Mitchell, Long, Mac Laurin, and Herschel, with others.

The system of Newton had an eminent supporter and able annotator, with an incipient elucidator, in the very eminent Scottish *Professor COLIN MAC LAURIN*, the youngest son of the Rev. John Mac Laurin, of Kilmudden, in the isle of Tirrie, on the coast of Argyleshire; born in the month of February, 1698, who, having lost his father within six weeks of his birth, was also deprived of his mother before his early education could be completed; the care of his education devolved thereby upon his paternal uncle, Daniel Mac Laurin. At the age of eleven years he went to the university of Glasgow, where the effects of his sedulous attention to his studies was soon very visible to his tutor and friends, among whom he had the honour to class the eminent Dr. Simpson, and other distinguished scholars, to whose libraries he had ready access; and other immunities, peculiar to the bias of his mind, were afforded him through their friendship. The peculiar disposition of his juvenile disposition for mathematical studies was made manifest by the circumstance of his having accidentally, at the early age of twelve, met with a copy of Euclid's elements; in a few days, he made himself master of the first six books, without assistance; he made such a surprising progress, that astonished all the professors; he soon found himself capable to solve the most difficult problems. In his fifteenth year, he took the degree of Master of Arts, with much applause; on which occasion, he composed and delivered a *Thesis* on the power of gravity. He now turned his attention to divinity—studied theology—spent one year in that study—quitted the university—lived in retirement with his uncle till 1717, when he proposed himself a candidate for a professorship, to fill the vacant mathematical chair in the Marischal College of Aberdeen; which he obtained, and executed the office with much capability; insomuch so, that he raised the study of mathematical learning to a pre-eminence it had not known in that university. During the vacations of 1719 and 1721, he came to London: on his first journey he was introduced to Dr. Hoadley, Dr. Clarke, and the illustrious Newton, whose notice and friendship he obtained, and ever after reckoned as the greatest honour and happiness of his life. In his first journey, he was admitted a Fellow of the Royal Society: two of his papers were entered in their Transactions. His book intituled “*Geometrica Organica*,” was published with the approbation of the President. In 1721, he became acquainted with Martin Folkes, Esq. after-

wards President, with whom he constantly maintained a close correspondence, and whom he also consulted upon most scientific subjects. In 1714, he obtained a prize in the Royal Academy of Sciences of Paris, whither he had gone in the suit of Lord Polesworth, then his Britannic Majesty's Minister Plenipotentiary to that court, as tutor to his Lordship's son. The theme on which he obtained that prize, was on the percussion of bodies, which obtained him much eminence in that capital and court, with numerous noble and most respectable friends. The substance of this paper he afterwards published in his treatise on Fluxions; and is likewise to be found in his second book on the discoveries of *Newton*. Through the interest of *Newton*, after his return, he was chosen assistant to Mr. James Gregory, in the professorship of Mathematics in the University of Edinburgh, where he soon became a very popular lecturer, and had seldom less than 100 young persons attending his discourses. These, according to their standing in the university, he divided into classes: to the *first* he taught the first six books of Euclid's elements, plain trigonometry, practical geometry, and the elements of fortification, with an introduction to algebra. To the *second* class, he entered more largely into algebra, read the eleventh and twelfth books of Euclid, instructed in spherical trigonometry, conic sections, and the general principles of electricity. The *third* advanced in astronomy and perspective, and read a part of Sir Isaac *Newton's Principia*, and had a course of experiments for illustrating them, performed and exhibited to them; he afterwards read and explained the elements of fluxions. With the next class he read his System of Fluxions, and explained the remainder of *Newton's Principia*.

In 1734, Dr. Berkeley, Bishop of Cloyne, published his treatise called "The Analyst;" in which he attempted to charge mathematicians with infidelity in matters of religion. This work was the occasion of Mr. Mac Laurin's elaborate Treatise on Fluxions, published at Edinburgh, in 1742, which is reckoned the most ample treatise, on that branch of novel mathematics, which has yet appeared. So very eminent was Mr. Mac Laurin's skill in mathematics and the principles of astronomical science, and he possessed such excellent instruments for these purposes, that a new theory never appeared, nor did any thing transpire in the scientific world which was uncommon, but his friends constantly resorted to him for explanation and experiment; and

their laudable curiosity was sure to be satisfactorily gratified.

We have been thus particular in the enumeration of particulars in the lives of those great men who have cultivated this science, for the purpose of availing ourselves of a suggestion furnished by Dr. Priestley, who observed “that we “could only see Newton in two points of his career: at the “bottom of the ladder, and at the top; having left no ac-“count of his progress, it appeared as though he had broken “the steps by which he had ascended, that none should follow.”

From the facts collected by the many eminent men, whose names have ornamented our pages, we are enabled to state the following particulars concerning that part of the universe denominated the *solar system*.

The planets already discovered, and which were known to *ancient* astronomers, are in number **EIGHT**, *viz.*

1st. The *Sun*, a luminous body, diffusing light and heat; whose diameter is computed at 890,000 miles; diurnal rotation on axis, 25d. 6h.; performs his annual revolution in orbit in 365d. 6h.; progressive equatorial motion in orbit, per hour, 3818 miles. He describes an elliptical orbicular track round the helio-centre, likewise the centre of all planetary motion, and, moreover, the centre of all planetary gravitation, which, though small with regard to the orbits of the planets, will appear large by multiplying the hours in a year by the above number 3818; which will give the extent of his orbicular circuit.

2d. *Mercury*, whose diameter is 3000 miles, revolves in an orbit 36,481,468 miles from that of the sun. He performs his annual period round that planet in 87d. 23h.; his hourly equatorial motion in orbit is 109,699 miles.

3d. *Venus*,—her diameter is 9330 miles; revolves in an orbit 68,891,486 miles distant from the sun; performs her annual revolution in 224d. 17h.; diurnal rotation on axis, 24d. 8h.; hourly equatorial motion in orbit, 80,295 miles.

4th. The *Earth*,—its diameter is 7970 miles; distance of orbit from the sun, 95,173,000 miles; revolves on axis in 24h.; performs her annual period round the sun in the same time the sun completes his revolution; hourly equatorial and progressive motion in orbit, 68,243 miles.

The *Moon* is a satellite to the earth; her diameter is 2180 miles; her diurnal rotation on axis is performed in 29d. 12h. 44m.; she performs her annual revolution round the sun in precisely the same time as does the earth, her superior planet; her motion in orbit, per hour, is 22,290 miles.

5th. *Mars*,—his diameter, 5400 miles; distance from the

sun, 145,014,148 miles; annual period round the sun, 671d. 17h.; diurnal rotation on axis, 19d. 12h. 44m.; hourly motion in orbit, 55,287 miles.

6th. *Jupiter*,—his diameter, 94,000 miles; distance from sun, 494,990,976 miles; annual period in 11yr. 314d. 18h.; diurnal rotation on axis, 9h. 56m.; hourly motion in orbit, 29,803 miles.

7th. *Saturn*,—his diameter, 78,000 miles; distance from sun, 907,956,130 miles; annual revolution in orbit, 22yr. 167d. 6h.; hourly motion in orbit, 22,101 miles.

It should be observed that Jupiter has four moons or satellites, with a large and very luminescent belt at a great distance from his surface. Saturn has also seven moons, with a very luminous ring about 21,000 miles broad from its uppermost to its undermost edge; and about the same distance from its surface.

The very eminent astronomer, Dr. HERSCHEL, discovered the planet since called by him the *Georgium-Sidus*, in honour of his patron, his present Majesty; the distance of the orbit of which planet from the sun is 1,758,000,000 miles; annual revolution, 82yr. 289d.; diameter, 56,726 miles; has two satellites or moons.

About 1801, 2, and 4, there were also discovered by *Piazzi*, *Olbers*, and *Harding*, three other small planets in the system of the sun; one called *Vesta*, another *Juno*, and the third *Pallas*: but not possessing *data*, we cannot furnish further particulars.

The fixed stars composing the *Zodiacal Signs* are divided into twelve constellations, one to each month; which asterisms were discovered by Flamstead to consist of the following number of stars to each:

<i>Aries</i> , or the Ram . . .	66	<i>Libra</i> , the Scales . . .	51
<i>Taurus</i> , the Bull . . .	141	<i>Scorpio</i> , the Scorpion .	44
<i>Gemini</i> , the Twins . .	85	<i>Sagittarius</i> , the Archer	69
<i>Cancer</i> , the Crab . . .	83	<i>Capricornus</i> , the Goat .	51
<i>Leo</i> , the Lion	95	<i>Aquarius</i> , Water-Carrier	108
<i>Virgo</i> , the Virgin . . .	110	<i>Pisces</i> , the Fishes . . .	113

A comparative idea of the extent of the works of Omnipotence may be perhaps collected, on our being informed that the sphere where the fixed stars appear is presumed to be placed far beyond the most remote planetary orbit; and that some of them are supposed to serve as suns to illumine other systems or worlds to us unknown.

CHRONOLOGY.

Chronology is defined to be the science of TIME, derived from *χρόνος* time, and *λόγος* a discourse. It certainly does not belong to this *period* of our labours: but conceiving it may serve to direct us in a great measure, and also believing that some articles in the succeeding *table* may excuse the introduction of certain other articles in the body of this work, it is here introduced. It defines the art of measuring time, by distinguishing its several constituent parts; as centuries, ages, years, months, weeks, days, hours, &c. by appropriate marks or characters; and of adjusting these parts in an orderly manner to past transactions, by means of eras, epochs, cycles, years, &c. to the illustration of history.

Without noticing chronology in the manner in which STURMIUS has viewed it, who divides it into five distinct branches, *i.e.* *metaphysical*, *physical*, *political*, *historical*, and *ecclesiastical*; we conceive the chief purpose will be answered, should we take a view of it only in that light which has relation to *history*. Accordingly, to that we propose to confine ourselves.

Of so much moment is it, in this point, to *history*, that a judicious author speaking of it, has by a strong metaphor, denominated it “One of the eyes, and the soul of history.” As its use is extensive, so is its difficulty of acquisition not inconsiderable; it requiring, in most instances, the aid of astronomy, geography, mathematics, geometry, trigonometry, plain and spherical; testimony of ancient authors, coins, medals, inscriptions, and other ancient monuments.

Its history, is however comparatively modern, as will be seen in the conclusion of the article.

Time, or transient continuity, can be only said to exist subsequent to the creation of those objects by which it is measured; which, to many, has appeared extremely uncertain, with respect to the creation of those luminaries, as well as of this globe, which reciprocally ascertain its continuity. Insomuch so, that from the confusion produced in scriptural chronology, from the various versions of the sacred writings, their interpolations and transcriptural mistakes occasioning great errors; the learned, and among them Petavius alleges that “To effect the same (chronology) “exactly, and without inspiration, is impossible, and be-“yond the arithmetic of any but GOD himself.”

Independent of the previously enumerated causes of chronological difficulty, there are others which those authors

take into consideration: such, for instance, as the various modes adopted by people to ascertain the date of events with certainty; among which the Egyptian appears conspicuous, and is resorted unto as a mediator, or middle system between the Hebrew and the Greek; wholly omitting the Chinese, whose records appear uncertain, from the tyrannical proceedings of *Tsin chi hoang*, who destroyed all their records preceding the 213th or 246th year before Christ. Omitting these, we say, the Egyptian had been fixed upon to reconcile the difference between the sacred era of the Hebrews, and the human epoch of the Greeks; but then the discovery was made that the Egyptians themselves sometimes reckoned by solar, and at others by lunar years: also, that the sacred colleges of *Thebes* and *Memphis*, at various periods, computed from different *data*, although the usual epoch of computation, or the grand Egyptian *era*, in an after period, occurred on the first *neomenia* after the rising of the asterism *Canis, Sirius*, or the *Dog-star*. All these considerations were weighed by the aforesaid learned authors, when they declared it was utterly impossible, without supernatural aid, to arrive at any degree of certainty. Things were thus circumstanced at the period *Raleigh, Du Halde, Whiston, Hyde, Newton*, and other eminent chronological writers were speculating upon this science: with how little satisfaction they proceeded to themselves, we may judge when we are apprized that no two of them could scarcely agree in fixing a certain era to any given point.

Also, it will be considered, that the Phœnicians varied with the next oldest historians, the Hebrews; *Sanchoniatho* their most celebrated historian, making two more descents in the line from Adam to Noah, than the Hebrew historians did in either the Hebrew or Samaritan copy of the Pentateuch. It will be admitted that numerous ages must have elapsed before the mode of computing time, or dating events had been brought into general or established use. With the sentiments of the learned author of a popular work, we should fully agree, did we not recollect that there were, besides the Greeks and other heathen nations, a people, on whom it was enjoined as a *religious duty* to attend to the phases and changes of the moon, to observe an anniversary feast called the feast of *in-gathering*, and other religious rites dependent on celestial observations; the observance of which times and ceremonies, in a subsequent period, we find, were considered by that people, a sufficient obedience to, and equivalent for all religious duties; and in lieu

of those pure moral precepts, which genuine religion never fails to inspire in the minds of its votaries:—such were the Hebrews.

This question long remained in a state of indecision and uncertainty, till it was ingeniously suggested that the immense number of years said to be on record of astronomical calculation in the archives of *Babylon*, might be, perhaps, only simple lunations: they were so reduced, and discovered to agree exactly with the chronology collected from the *Pentateuch*.

Trusting to the well-known liberality of our friend, the *Indian Antiquary*, we propose to adduce the substance of some arguments he has used in his very erudite work lately published, intituled “*Observations on Babylon*,” &c. because we find they are pertinent to our present subject. He first observes the difference of opinion which had existed among the literati, whether the Chaldeans or Egyptians were the most ancient astronomers, the former boasting for the patron of their order, *Belus*, the grandson of Noah, the founder of the mighty fabric that bears his name. The Chaldaic historians, it appears, carried up their historical annals to an almost incredible height, according to *Cicero*, of 47,000 years: “*Babylonios, eos qui ex Caucaso cœli signa servantes, numeris et mortibus stellarum cursus persequuntur; qui 470 nullia annorum UT IPSI DISCUNT, monumentis comprehensa continent.*”

It also appears they had among them three grand *Cycles*: 1st, the *Saros*, on the authority of *Abydenus*, of 3600 years; 2d, the *Neros*, of 600 years; and, 3d, the *Sorros*, of 60 years. Although these years are now, and have been suspected exagerations, yet they may be susceptible of reduction to chronological and historical proof. We would not be more credulous than others; nor would we shut our eyes against probability, to the exclusion of truth; neither would we assume to ourselves information superior to others; but we certainly do submit, that those early people from having superior incentive to cultivate, and a better opportunity to observe, 1st, from the length of their lives; 2d, from the very clear atmosphere of the region than most others, were, from thence, well acquainted with astronomy; insomuch so, that the accomplished inhabitants of Greece have borrowed from them their famous *Meteonic Cycle*, which is still used in Europe, as the most perfect medium for reconciliation of the solar and lunar difference of revolution,—when we find it had been previously used in Chaldea long before its introduction into Greece; upon which, modern astronomers, notwith-

standing their boasted improvements, have not been able to devise a better method, and it is still from its excellence denominated the *Golden Number*. Hence we contend that, the Babylonians being well acquainted with the principles of astronomy, whether they calculated by solar years, or by lunations, they are as likely to be as correct as modern astronomers; and astronomy being the only sure criterion by which time, when not recorded in the ancient *natural Hebraic* manner, by days and years, can be ascertained; because, by its *objects*, transient continuity must be measured with certainty; we must presume them to be correct, in defiance of the fashionable scepticism of modern ignorance. Also, taking into consideration that the first of men were commanded to observe the monthly feast of *neomenia*, or full moons; and the annual feast of *in-gathering*, &c. Although we are aware that the inhabitants of *Chaldea* were the first who neglected the ordinances, and forsook the altars of the living **God**, yet they must have retained, in common with other nations, the recollection of the divine instructions, and they did so much venerate the host of heaven, that with them the superstition of idolatry and the *Sabian* worship first commenced; they worshipping those splendid creatures they observed enthroned in the air, for the living **God**. From their having so regarded these, we also contend, that *probability* strongly favours that they would be more exact in the observance of their motions, from having them constantly in their thoughts: now what we most think of, our acquaintance therewith is the more improved. Therefore these reasons are offered among many others which might be adduced, to prove the Chaldean chronology the most likely to be perfect. A subsequent observation on the report of *Callisthenes* to his uncle and preceptor *Aristotle*, will appear in this state of the argument, with singular effect; and we imagine it will be conclusive: as it also tends to confirm the previous assertion of *Cicero*, it is decisive with us. Although the prejudices of mankind may be shaken, it is observed, that at the time of the Macedonian conquerors going against the *great King*, (the Persian monarch being so called in Greece,) he took in his train besides geographers and others, *Callisthenes*, a pupil of Aristotle's; that philosopher enjoined the young man to ascertain the remotest date of the Babylonian records:—the *Magi* of *Chaldea* (of which country Babylon was the capital, and which at that time formed a portion of the Persian dominions,) informed the young philosopher, that from that time, *i.e.* 330 years before the Christian era, they

had on record astronomical observations on bricks, *cocciliibus laterculis inscriptas*, bricks baked in a furnace, for 1903 years; which the learned Indian antiquary observes, calculating by the Chaldean Saros of 223 lunations for nineteen years, would bring that time about coeval with the period of Belus; which Belus was in reality, though often confounded by theological and human authors with the identity of *Nimrod* himself, yet he was the son of Nimrod, and father of *Ninus*, the founder of the Assyrian monarchy, and the *first* student in astronomy, or rather astrology: and on that account deified by his people under the denomination of *Jupiter Belus*. We have seen in the article last given, the honours he had paid him by his surviving subjects, as the parent of that art, for which the Chaldeans were so very eminent.

Sir Walter Raleigh, who is viewed as a good authority, thus divides the period of the world, from the creation to the end of the reign of Perseus and his dynasty, into five different epochs: 1st, from the creation to Abraham; 2d, from Abraham to the destruction of Solomon's temple; 3d, from the destruction of Jerusalem to Philip of Macedon; 4th, from Philip of Macedon to the race of Antigonus; 5th, from the establishment of Alexander until the conquest of Asia and Macedonia by the Romans.

The name of *Newton* is pronounced with respect; but we submit, that among men eminent for genius, there is a period when their faculties experience decay: it is said this was the case with *Homer*, the first of intellectual characters, when he wrote the *Odyssey*: others have from a false veneration for religion, endeavoured to support erroneous systems of philosophy, as we perceive was the case with *Tycho Brahe*, in the last article. Now we believe, that from both these causes the illustrious *Newton* suffered, as he never showed his intellectual imbecility to its extent until he wrote his *Chronology*, the last work he produced, which is in our simple conception liable to much objection; and to name one instance, when he comes to speak of *Sessac*, or the Egyptian *Sesostris*.

The opinion of an editor of a popular work,³ is pertinent: “ *Ephorus*, the disciple of *Isocrates*, digested his records “ by generations; accordingly *Polybius* is of opinion, “ (lib. v. §. 33.) that this historian of *Cumæ*, was the first “ who attempted to reduce chronology into a regular “ science, under the form of universal history. It is known “ he flourished in the time of *Philip of Macedon*, about “ 350 years before the Christian era; and he began with

³ See Dr. Rees's Cyclopædia, article *Chronology*.

" the return of the *Heraclidae* into Peloponnesus, and
 " ended his chronological history with the siege of Perin-
 " thus, in the twentieth year of Philip, the father of Alex-
 " ander the Great, eleven years before the fall of the
 " Persian empire. The Arundelian Marbles, however,
 " composed sixty years after Alexander's death, take no
 " notice of olympiads, but reckon backwards from the
 " then present time by years; also in the histories of *Herodotus* and *Thucydides*, the dates of events are not ascer-
 " tained by any fixed epochs; nor were the olympiads
 " applied to this purpose at so early a period. *Timæus* of
 " Sicily, who flourished in the reign of Ptolemy Philadel-
 " phus, about the third century before Christ, or in the
 " 129th olympiad, was the first who attempted to establish
 " an era, by comparing the dates of olympiads of the
 " Spartan kings, the archons of Athens, and the priest-
 " esses of Juno, and adapting them to one another, according
 " to the best of his judgment. Where he left off, *Polybius*
 " began and continued the history. Before this period,
 " nothing satisfactory on the subject of Chronology seems
 " to have appeared, for the obvious reason, that before
 " Alexander's conquests in the East, the Greeks had very
 " scanty materials for such a work, their knowledge being
 " then confined to a narrow tract of country, and their
 " annals to a short period." Previous thereto, it should
 appear the siege of some remarkable town, as *Troy*, or
Thebes, for instance, served as common eras. Anterior to
 this, they had three distinct periods of time; according to
Varro, the first from the beginning of the world unto the
 general deluge of *Ogyges*, they termed *Ἄδελλων* *Adelon*, that
 is, the space which occurred before time was,—unmanifest,
 and therefore, unknown. Sir *Thomas Browne*, in his *Pseudodoxia Epidemica*, c. vi. declares, that—“ Though divers
 " authors have made mention of the deluge, as *Manethon*,
 " the *Egyptian* priest, *Xenophon*, *de Äquivocis*, *Fabrus*
 " *Pictor de Anteco seculo*, *Mar. Cato*, *de Originibus*, and
 " *Archilocus*, the *Greek*, who introduceth also the testimony
 " of *Moses*, in his fragment *De Temporibus*; yet have they
 " delivered no account of what preceded or went before.”
Diodorus Siculus hath in his third book a passage, which
 examined, advanceth as high as *Adam*, “ For the Chal-
 " deans,” saith he, “ derive the original of their astronomy
 " and letters *forty-three thousand years before the monarchy*
 " *of Alexander the Great*.” *Xenophon* says, those years
 must be considered as lunations; when the computation
 may arise to *Adam*; and this reconciles their chronology of

time from the beginning of the world unto the reign of Alexander; as rendered by *Annius of Vitulo*, in his commentary upon *Berosus*.

The second period they denominated *Μυθικὸν, Mythicon*, or the fabulous, because the accounts of that period are delivered as certain truths, so involved in fabulous uncertainty, that nothing sure or conclusive can be depended upon: some accounts and illustrations of that period are however given in the works of *Dares Phygias*, *Dictys Cretensis*, *Herodotus*, *Diodorus Siculus*, and *Trogus Pompeius*. The most famous of the Grecian poets also flourished in that period; as, *Orpheus*, *Linus*, *Musæus*, *Homer*, and *Hesiod*. From whom came the origin of those beautiful allegories and mysterious fables, which were subsequently adopted by historians and philosophical writers,—and which perturb the records of *Egypt* and *Chaldea* with fabulous additions, confounding real names and relations with the creatures of their poetical invention.

The third period they called *Ἱστορικὸν, Historicon*, or the *historical epoch*, wherein matters have been correctly related, and may therefore be believed. The historians to whom they assigned credit are *Herodotus*, *Thucydides*, *Xenophon*, *Diodorus Siculus*,—the first and last of these have written universal histories,—sometimes chronological; *Philo* and *Josephus*, (whose narrations relate chiefly to the Hebrews, of which people they were,) *Eusebius*, *Julius Africanus*, *Orosius*, *Ado of Vienna*, *Marianus Scotus*, the author of *Historica Tripeuta*, *Vespergensis*, *Carion*, *Plinedas*, *Salian*, and *Sir Walter Raleigh*.

Previous to the conquests of Alexander, the Grecian travellers could not easily communicate historical memoirs of those countries through which they occasionally passed, as the barbarous manners of that time (the Greeks denominating all other people besides themselves *barbarous*) did not afford them the necessary advantages for that purpose; and even when those were allowed, their ignorance of the manners and language of the country, might preclude their benefiting from public records, and other monuments of national antiquity. Particularly, when we consider Dr. *Wilkins*, the learned editor of *Richardson's Persian and Arabic Lexicon*, hath observed,⁴ that the literal tongue of a people is but a bare outline of its language;—contending that popular manners, local customs, and idiomatical habits, are necessary to be known to arrive at the true knowledge of any language. If this position be admitted, then it necessarily follows, that years of residence among a people

⁴ Vide preface.

would be scarcely sufficient to arrive at a proper degree of knowledge to obtain a correct conception of its ancient history. General wars, though certainly entitled to reprobation, may, in this signal instance, have been of the greatest benefit to the improvement of Grecian knowledge, who in return assuredly promulgated the advantages they obtained from those they conquered, reciprocally to the world. So the Alexandrine conquests in Asia were the precursors of intelligence to Greece of a large portion of that extensive continent, extending also to many parts of Africa. *Strabo*, in *Geog.* lib. i. informs posterity that the Greeks derived great advantages in geographical knowledge from the conquests of Alexander, since, from that occasion, not only *Asia*, but the north of Europe was made known to them. Thence they became possessed of every intelligence which Chaldea, Egypt, and the northern nations could supply,—which the most ancient seminaries could afford. From Greece, Rome derived most of her historical, philosophical, geographical, astronomical, and literary intelligence, from whom it was introduced into Christendom; as Roman influence extended beyond the *Ister* even to the *Tyra*, as far north as the countries round the lake *Mæotis*, and the sea-coast to *Colchis*: those countries being unknown to the west till the time of *Mithridates*, surnamed *Eupator*, king of *Pontus*. The *Parthian* empire made *Hyrcania*, *Bractia*, and the *Scythians*, who lived beyond them, better known.

Therefore, taking it for granted, that no general history could be compiled, till the geography of local situations became known;—for to ascertain the relative strength of these states must have been very material to the science of the historian—in describing those countries. Likewise it was of moment in detailing the progress of armies,—connexion of provinces, &c. which might be won or lost, in national quarrels. But when access to those kingdoms was procured,—when their manners, language, legislation, and records, became known to their conquerors, and after the Greek and Roman languages became, as it were, the universal languages of Asia, Egypt, and a great part of Europe; it afforded peculiar opportunities to several eminent and illustrious men to write the histories of those nations. *Berosus* composed the history of *Chaldea*, from the *Babylonish* records; *Manetho* that of Egypt, from those of *Thebes* and *Memphis*; the *Marmora Arundeliana* supplied a narrative of principal facts for Grecian history; and *Herodotus* and *Pausanias* detailed the transactions of Greece, from the earliest periods of its history. When we likewise consider

the immense library collected by the *Ptolemies*, at Alexandria, in which were to be found the writings of all nations.

Till that time there did not exist a sufficiency of materials for general historical purposes;—and without intelligence of a general nature, it is scarcely possible to compose any historical work, because the transactions of several periods and many nations, sometimes are found to influence events in other times and places. From hence the very eminent *Eratosthenes*, that systematic and scientific character,—being appointed its librarian, by *Ptolemy Evergetes*, about 100 years after Alexander's death, by this means he became possessed of so immense a multitude of historical facts that enabled and excited in him a desire to fix the relative *data* to various periods. *Dionysius of Halicarnassus* informs us that, in the execution of that task, the librarian had collected facts to establish certain *canons* of chronology; which he himself discovered to be amazingly accurate, having examined them in his treatise written on the subject; which to the irreparable injury of the interests of science is lost, yet the chronological principles are retained in the *Stromata* of *Clemens Alexandrinus*, as follows:

	Years.
From the taking of Troy, to the return of the Heraclidæ	80
From the return of the Heraclidæ, to the settlement of Ionia	60
From that period, to the guardianship of Lycurgus	159
From that event, to the year next preceding the first olympiad	108
From thence, to the invasion of Xerxes	297
From his invasion, to the beginning of the Peloponnesian war	48
From the beginning to the end of that war	27
From the end of the Peloponnesian war, to the battle of <i>Leuctra</i>	34
From that battle, to the death of Philip	35
From the death of Philip, to that of Alexander	12

That the preceding numbers agree with the *Clementine*,—with a passage in *Dionysius Halicarnassus*, and with the canons of *Eratosthenes*,—will be evident on comparing them with those works. Circumstances may be also collected from *Apollodorus*, the disciple of *Panætius*, to prove that he pursued the track marked out by his predecessor *Eratosthenes*. They both agreed concerning the interval which elapsed between the fall of Troy, and the return of the Heraclidæ, making it exactly 80 years. They both

also concurred concerning the age of *Lycurgus*, pursuing the same method to arrive at the conclusion.

The same order was observed by *Apollodorus*, as had been pursued by his predecessor in the genealogy of the *Theban* monarchs. Further, as though the concurrent judgment of subsequent chronologists, because sanctioned by their approbation,—the design adopted by *Eratosthenes*, and pursued by *Apollodorus*, all succeeding chronologists have traced the same course they marked out, and have happily succeeded in arriving at the same conclusions in historical facts, as those events had relation to time in fixing periods for their consummation.

Chronologists, notwithstanding the before-mentioned introduction of the art, laboured under disadvantages in the highest degree detrimental, with respect to many points in local history. First, feeling a peculiar interest in every thing relating to Egyptian concerns, we must lament whilst we notice, that the transactions of that devoted country suffered an irreparable injury from the ravages committed by the more than lunatic Persian, *Cambyses*, who destroyed all its records that were perishable. Next, its local history and the interests of learning and science felt a deadly wound when the ignorance of Saracenic-hypocritical Mahomedanism defeated those truly laudable designs of the Ptolemies, in a later period, at the time the energy of its, superstition desolated Alexandria under the command of *Amrou*, the general of the Caliph *Omar*, anno 660.

Anterior to the period of *Psammitichus*, *Herodotus* himself has confessed the Greeks knew nothing of Egyptian affairs; the occasion of their then becoming acquainted with them, was owing to certain Greeks having assisted that prince to the throne of his country;—from thence they were very intimate with Egyptian affairs. The *Ionians* and *Carians*, occupying the sea-coast below the city *Babastis*, on the Pelusiac branch of the Nile, till in succeeding times *Armasis*, king of Egypt caused them to abandon their habitations, and settle at Memphis, to defend him against the Egyptians. From the time of their establishment, he says, they had so constant a communication with the Greeks, that it may be justly said they knew all things which passed in Egypt from the reign of *Psammitichus*, to that (his) age.

The partial destruction of Roman records by those enemies, destined to the ultimate destruction of the imperial power, and to demolish the splendour of that too widely extended empire, in various periods previous to its final overthrow: *i. e.* first, in 569 years before Christ; 2d, 84 years before the death of Alexander the Great; 3d,

454 years before the Christian era ; 4th, 390 years before the same epoch, and 64 years anterior to the death of Alexander of Macedon.

Fabius Pictor was the oldest *Roman* historian, and he took all his *data* from *Diocles Preparentius*, a Greek.

There were endless disputes among the Greeks and Romans, at the time they were endeavouring to determine their respective local chronology.

Sir Isaac Newton observes, after noticing many errors in ancient chronology, that though many of the ancients computed by generations and successions, yet the Egyptians, Greeks, and Latins, reckoned the reigns of kings equal to generations of men, *i. e.* three of them to 120 years. He observes that this is the foundation to their technical chronology. He next notices that from the ordinary course of nature, with a detail of historical facts,—this difference between reigns and generations may be made, and that though the latter from father to son may be reckoned on an average at about thirty-three years, or perhaps three of them equal to 100, yet he says when they are taken from the eldest sons, they cannot amount to above 75 or 80 years. And the reigns of kings are still shorter, so that 20 years may be reckoned as a just medium. He then regulates his opinion on Greek chronology by the previous chart of *Eratosthenes*, taking the same epochs, *i. e.* the return of the Heraclidæ to Peloponnesus, the taking of Troy, &c. and he appears to go on pretty regular, till he comes to Egyptian history, when he is utterly lost, splitting upon the great name of *Sesostris*, a name he is apt to see like as is said of men in liquor, when the visual aid deceives them, inducing them to see the same object double ; this does Newton with respect to that prince,—nothing else is seen but *Sessac* or *Sessack* to answer the character of several individuals.

There are eight different chronologers of the first eminence who have endeavoured to fix the era of this prince, and the extreme of their difference amounts to nearly 600 years. There are upwards of 300 different systems of eminence ; but found generally to differ from each other in some particulars.

We conceive it is a folly to attend to, or suffer the authority of a name to divert us from truth ; when it may be attained on much surer and more certain principles than the speculative theory of any man how eminent soever. There is already constructed a chronicle, with reference to principal events in Greek history, called the **PARIAN CHRONICLE**, which is preserved among the *Arundelian*

Marbles. This has had the *lacunæ* supplied by the learned *Selden*, and others fully competent, which has been translated by the ingenious and learned Mr. Hewlett. This Chronicle has received the sanction of the most learned as to its authenticity, and as far as it respects the local chronology of Greece, we think it should be received.

With reference to the sacred chronology, we submit that which is constructed on the Samaritan copy is the most likely to be correct, concurring here in the judgment of the authors of the “*Universal Ancient History*.”

The *Varronian* era of the erection of Rome is established to have occurred, as that, the most learned of *all* the Romans, has fixed it, at 753 before Christ. This will serve as a certain epoch to reckon from, which calculation may be made by the reigns of its kings, the continuance of its commonwealth, and the various well attested periods of its emperors, which well authenticated history will furnish. Correcting the whole by well attested eclipses of the superior luminaries of heaven. Thus we have, we hope, pointed out a mode by which any person may satisfy himself rationally, as to the occurrence of any remarkable event, which has occurred in the history of the world.

Accordingly, from the Samaritan text, *Julius Scaliger* fixes the era of the Creation at—years before Christ 4427

Usher, Lloyd, Simpson, Calmet, Le Chaise, Blair, and the *English Bible*, gives the same at 4004 Concerning which event, there are no less than three hundred different opinions, as enumerated by *Kennedy*, in his *Chron.* p. 350.

The year of the nativity of our Lord, is also a controverted point. We possess ten different opinions of this point, generally calculated by the era of the foundation of Rome taken as a *datum*, the greatest difference of which opinions is, strange to say, no less than 91 years!

The Samaritan text supplies the *era* of the *deluge* to have been subsequent to the creation 2998. Concerning which event, we have the result of opinions enumerated by Professor *Hales*, fourteen other calculations, the extreme difference of which is 1142 years. The date adopted by the authors of the *Ancient Univ. Hist.* is that above given from the *Samaritan* text, and which appears to agree with the rise, progress, and date of the great families and empires of *Assyria, Egypt, India, and China*. The same is also adopted by Captain *Wilford*, in his *Observations on Hindu Mythology*, published in the *Asiatic Researches*.

The fourth considerable epoch is the *exode* of the Israelites from Egypt. Concerning which event we have nine different opinions.

B. C.

Scaliger and *Strauchi* fix it at 1497

Usher and the English Bible 1491

The vulgar *Jewish* chronology 1312

Of the various opinions to which we have referred, all are different in nearly equal proportion to those distinctions which appear in the above cited specimen.

B. C.

The *fifth* considerable epoch is the return of Sesostris from his Indian expedition, which *Playfair* fixes at 1555

And *Marsham* at 967

We have before us six other opinions, exclusive of these two extremes, which other opinions vary very considerably, and the largest total difference in opinions above cited is 588 years.

The *sixth* epoch of importance we shall consider, is the period of the destruction of Troy. Concerning which, we have *ten* different opinions from nine various authorities. Of which there are two opinions given from the *Parian Chronicle*, varying twenty-five years. The difference of the extremes in the remaining nine authorities, is no less than 366 years!

The *seventh* period which will be mentioned, is the date of the foundation of *Solomon's temple*, from the *exode* of the Israelites from Egypt. Respecting which event, we have no less than sixteen different opinions, from as many authors, where the extremes differ 262 years. As a specimen we take the first and last.

	Years.
<i>Julius Africanus</i>	741
<i>Eusebius</i> and <i>Usher</i>	479

Difference . . . 262

B. C.

The *eighth* chief event we notice, is the era of the foundation of Rome, which is thus stated by *Varro*, from proclamations of the Emperors *Augustus*, *Claudius*, &c.; by the historians, *Tacitus*, *Plutarch*, *Dion*, *Aulus Gellius*, *Censorinus*, *Onuphrius*, *Baronius*, &c.; and in the chronology of *Petavius* and *Hales*, &c. . . . 753

By *Newton*, the last of seven calculations . . . 627

Giving a difference of . . . 126 years.

The *ninth* epoch is the overthrow of *Nineveh*, concerning which there are no less than thirteen various opinions, given by eleven different chronologers.

	B. C.
<i>Petavius</i> gives first	896
And, secondly	597
The last extreme is <i>Vignoles</i>	596
Whilst Marsham's and the Universal History give . . .	605

Should it appear strange that those chronologists differ; it can, perhaps, be reconciled, by remembering, that they have each proceeded upon some different *hypothesis*; whence that their conclusions vary is not extraordinary; but if they differ upon those events so much, should it not excite our wonder and increase our surprise, when we reflect that, upon a circumstance not depending upon the record of any human transactions, their statements are equally various respecting an event which might be ascertained with mathematical demonstration, in relation to an eclipse. The eclipse to which we allude, is the one foretold by *THALES*, of *Myletus*, and which occurred at the moment of the battle between the *Medes* and *Lydians*; an event of the utmost importance in adjusting the Median, Lydian, and Assyrian chronology. Concerning this event, there are six different opinions of various import. The first and last, being the extremes in date, we shall furnish:

	B. C.
<i>Calvisius</i>	July 30, 607
<i>Scaliger</i> from <i>Eudemus</i>	October 1, 583
Affording a difference of twenty-four years and one day.	

If such is the wide discordance among the learned, respecting the chief events which have occurred on the mundane theatre, how great may be the difference respecting the relations of historians on circumstances not of so much importance, and where the variation may arise from different impressions upon the subject?

Greek Chronology.—Preferring historical chronology, where the best informed approve of it, we subjoin the following chief epochs, extracted from the Rev. Mr. Hewlett's translation of the celebrated *Parian Chronicle*.

CHRONICON PARIUM

EX

MARMORIBUS ARUNDELIANIS.

I. PERIOD.

B. C.

* * * * * I have described pr[eceding times,] begin[n]ing from *Cecrops*, the first who reigned at Athens, until [Ast]yanax, archon at Paros, and *Diognetus* at Athens: [ending Ol. 129, 1. B. C. 264.]

1. Since <i>Cecrops</i> reigned at Athens, and the country was called <i>Cecropia</i> , before called <i>Actica</i> , from <i>Actæus</i> the native, MCCCXVIII years	1582
2. Since <i>Deucalion</i> reigned in <i>Lycoria</i> near <i>Parnassus</i> , <i>Cecrops</i> [re]ign[in]g at Athens, MCCCX years.....	1574
3. Since the trial at Athen[s] hap]pened between <i>Mars</i> and <i>Neptune</i> , concerning <i>Halirrothius</i> [the son] of <i>Neptune</i> , and the place was called <i>Areopagus</i> , MCCLXVIII years: <i>Cr[ana]us</i> reigning at Athens	1532
4. Since the deluge happened in the time of <i>Deucalion</i> ; and <i>Deucalion</i> fled from the rains, from <i>Lycoria</i> to Athens, unto [<i>Crana]us</i> , and bu[ilt the temp]le of <i>Jupiter Olympius</i> , and] offered sacrifices for his preservation, MCCLXV years: <i>Cr[a]n[a]us</i> reigning at Athens	1529
5. S[ince <i>Amphi]ctyon</i> [the son] of <i>Deucalion</i> reigned in <i>Thermopylæ</i> , and assembled the people inhabiting that district, and [nam]ed them <i>Amphictyones</i> , and [the place of council] <i>P[ylæa]</i> ,] w[here] the <i>Amphictyones</i> still sacrifice, MCCLVIII years: <i>Amphictyon</i> reigning at Athens	1522
6. Since <i>Hellen</i> [the son] of <i>Deuc[alion]</i> reigned in [<i>Phthi]otis</i> , and they were [na]med <i>Hellenes</i> , who before were called <i>Graikoi</i> (Greeks), and [they instituted] the <i>Panathe[næan]</i> games, MCCLVII years: <i>Amphictyon</i> reigning at Athens	1521

B. C.

7. Since *Cadmus* [the son] of *Agenor* came to Thebes, [according to the oracle, and] built the Cadmea, MCCLV years: *Amphictyon* reigning at Athens..... 1519

8. Since [*Eurotas* and *Lacedæmon*] reigned in [La-co]nia, MCCLII years: *Amphictyon* reigning at Athens..... 1516

9. Since a shi[p with si]f[ty oar]s sailed from Egypt to Greece, and was called *Pentecontorus*; and the daughters of *Danaus* [*Amy-m]one*, and *Ba* and *Helice* and *Archedice*, elected by the rest, [bu]il[t a temple,] and sacrificed upon the shore at Para[li]as, in Lindus [a city] of Rhodes, MCCXLVII years: *Erichthonius* reig[ning at Athens].... 1511

10. [Since *Erich]thonius*, when the Panathenæa were first celebrated, yoked [horses to] a chariot, and exhibited the contest, and [changed the name] of Athenæa; and [the image] of the mother of the [g]ods appeared in [the mountains] of Cybele; and *Hyagnis* the Phrygian first invented flutes at C[elæ]ne [a city] of Phrygia, and first played on the flute [the harmony] called Phrygian, and other *nomes* (tunes) of the mother [of the gods] of Dionysus, of Pan, and that of [the divinities of the country, and the heroes], MCCXLII years: *Erichthonius*, who yoked [horses to] the chariot, reigning at Athens 1506

11. Since *Minos* [the] fir[st relig]ned] and built [Cy]donia; and iron was found in Ida, by the Idæi Dactuli *Celmis* [and *Damnaneus*, MCLXVIII years]: *Pandion* [reig]ning at Athens [1432]

12. Since *Ceres* coming to Athens pla[nt]ed corn, and first [sent it to other countries] by *Triptolemus* [the son] of Celeus and Neæra, MCXLV years: *Erichtheus* reigning at Athens 1409

13. Since *Tripto[lemus]* sowed [corn] in Raria, called Eleusis, M[C]XL[III] years: [*Erichtheus*] reigning at Athens..... 1406

14. [Since *Orpheus*] pub[li]shed his poem [on] the rape of the Virgin [*Proserpine*], and the search of *Ceres*; his [descent to the shades],

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and [the fables] concerning those who received the corn, MCXXXV years: *Erichtheus* reigning at Athens.....

15. [Since *Eumolpus* the son of *Musæus* celebrated the mysteries in Eleusis, and publish[ed] the po[em]s of h[is father *Musæus*], MC . . . years; *Erichtheus* [the son] of *Pandion* [reigning at Athens].....

13.

16. Since a lustration was first performed [by slaying [ML]XII [years]: *Pandion* the [son] of *Cecrops* [the second] reigning at Athens

1326

17. Since the Gymnastic [Games were instituted i[n] Eleusis, [M] . . . X . . . years: *P[andion]* the son of *Cecrops* reigning at Athens]

18. Since [human sacrific]es [and] the Lycæa were celebrated in Arcadia, and of *Lycaon* were given [among] the Gr[ee]ks, M.. years: *Pandion* [the son] of *Cecrops* reigning at Athens

19. Since Hercules, having been pur[ified] in Eleusi]s, [was initiated the fir]st of [stran]gers, M . . . [years]: *Ægeus* reigning at Athens..

20. Since a [scarcity] of corn happened at Athens, and [Apol[lo being consulted by [the] Athene]ians] ob[liged them]to under[g]o [the penalti]es wh[ich] *Minos* (the second) should require, MXXXI years: *Æg[eus]* reigning at Athens

1295

21. Since *Thes[eus]* incorporated the twelve cities of Attica into one (community); and [having first establish]ed a civil constitution and a popular government at Athens, he instituted the Isthmian Games, after he had slain *Sinis*, DCCCCXCV years

1259

22. From the first (celebration of the festival called) Ammon, [DCCCCXC]II years: *Theseus* reigning at Athens.....

1256

23. Since *Adra[stus r]eign[e]d* over the Argi[ves], and [the seven commanders in]st[itut]ed the Games [i]n [Nemea,] DCCCLXXXVII years: *Theseus* reigning at Athens

1251

24. Since the [Gree]ks militated against *Troy*, DCCCCLIV years: [Men]estheus reigning at Ath[ns], in the thirteenth year (of his reign)

1218

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25. Since *Troy* was taken, **DCCCCXLV** years :
 [Menesth]eus reigning at Athens, in the (twenty)
 second year (of his reign), on the twenty-
 fourth day of the month *Th[argelio]n*

1209

26. Since *Orestes* [in *Scythi]a* was cured of his
 madness] and [a cause] between hi[m] and
 [Erig]one, the daughter of [Æ]gisthus, [con-
 cerning] (the murder of) *Ægisthus*, was tried
 in Areopagus, which *Orestes* gained, [the
 vot]es [being equal], **[D]CCCCXXX[X]II**
 years : *Demophon* reigning at Athens.....

1206

27. Since *Teucer* built [Salamis in] Cyprus, **DCCCC**
XXXVIII years : *Demophon* reigning at
 Athens

1202

28. Since *Ne[l]eus* bui[l]t Miletus in Caria, having
 collected the Ionians,] who [bui]lt Ephesus,
 Erythræ, Clazomene, P[riene, and Lebedus,
 Teos,] Colophon, [M]yus, [Phocea,] Samos,
 [Chios ;] and the [Pan]ioni[a] were instituted,
[DCCC]XIII years : *Menestheus* reigning at
 Athens, in the thirteenth year [of his reign]..

1077

29. Since [Hes]iod the poet [flourish]ed, **DCLXX**
 [X] years : ——— [reigning at Athens]...

30. Since *Homer* the poet flourished, **DCXLIII**
 years : **[D]iognetus** reigning at Athen[s]....

907

31. Since *Ph[ei]don* the Argive was pros[cribed],
 and made [measures and weights,] and coined
 silver money in *Ægina*, being the eleventh
 from *Hercules*, **DCXXXI** years : **[Megac]les**
 reigning at Athens

895

II. PERIOD.

32. Since *Archias* [the son] of *Evagetus*, being the
 tenth from *Temenus*, conducted a colony from
 Corinth, [to] Syracu[se, **CCCCXCIV** years:]
Æschylus [reign]ing at Athens, in the twenty-
 first year [of his reign]

758

33. Since *[C]r[e]on* was annual Ar[ch]on, **CCCCXX**
 years

684

34. Since *[Tyrtæus* with the Lacedem]o[nians
 fought against the Messenians] **CCCCXVIII**
 years : *Lysi[as]* being Archon at Athens....

682

35. Since *Terpander* [the son] of *Derdeneus* the
 Lesbian, [dire]cted the flute-pl[ayers] to
 [ref]orm the tunes of the [An]ci[ents,] and

B. C.

changed the old music, **CCCLXXXI** years : *Dropilus* being Archon at Athens.....

36. Since *A[lyatte]s* reigned in [Lydi]a, **[CCCX]LI** years : *Aristocles* being Archon at Athens....

37. Since *Sappho* sailed from Mitylene to Sicily, flying **[CCCXXVIII]** years] : *Critias* the first [being Arch]on at Athens ; the [Geo]mori possessing the government in Syracuse

38. [Since the *Amphictyones* conquered, having invaded Cyrrha, and the Gymnastic games were celebrated, the prize being allotted out of the spoils, **CC[C]XXVII** years : *Simo[n]* being Archon at Athens.....

39. Since [the Gymnastic] games were again celebrated, [in which the prize was a cro]wn, **CCCX[X]II** years : *Damasias* the second being Archon at Athens.....

40. Since Come[dies] were carried in car]ts [by] the Icarians, *Susarion* being the inventor, and the first prize proposed was a bask[et] of figs, and a small vessel of wine, **CC** [years :.....] being Archon at Athens....

41. Since *Pisistratus* became tyrant at Athens, **CCXCVII** years : *C[omi]as* being Archon at Athens

42. Since *Cræsus* s[ent ambassadors out] of Asia [to] Delph[i], **CCX]CII** [years : *Euthy]demus* being Archon at Athens.....

43. Since *Cyrus*, King of Persia, took Sardis, and [apprehended] *Cræsus*, who was de[ceived by the [Pyth]ia, [284 years] : *Er[xiclides]* being Archon at Athens.] At this time [lived] *Hippanax*, the Iambic poet.....

44. Since *Thespis* the poet [flourished, the first who] taught (or exhibited) [tragedy,] for which a [g]oat was [ap]pointed [as the prize,] **CCL[XXIII]** years : *[Alc]æus* the first being Archon at Ath[ns]

45. Since *Darius* reigned over the Persians, (*Smerdis*) *Magus* being dead, **[CC]L[VI]** years : being Archon at Ath[ns]....

46. Since *Harmodius* and [Aristoge]iton sle[w *Hippa]rchus* [the son] of *Pisistratus*, [the tyra]nt

645

605

592

591

586

57.

561

556

[548]

[537]

[520]

of A[thens], and the Athenians co[nspir]ed to ex[pel] the Pisistratidæ [from their retreat within the Pelasgi]c wall, CCXLVIII years: [Clisthenes] being Archon at Athens 512

47. Since choruses of men first contended, [and] Hypo[di]cus the Chalcidi[an], having taught one [of them] gained the vict[ory], CCXL[IV] years: [I]sagoras being Archon at Athen[s] 508

48. Since the temp[le of Minerva] Hippia [was built] at Athens, CCXXXI years: Pythocritus being Archon at Athens. 495

49. Since the battle at Marathon was fought by the Athenians against the Persians, [and] the Athenians defeated [Artaphernes, th]e ne-p[hew] of Darius, who commanded (the Persian forces,) CCXXVII years: [Phœnippus] the second being Archon at Athens. In which battle Æschylus the poet fought, being [then] XXXV [y]ear[s of age]. 491

50. Since Simonides, the grandfather of Simonides the poet, being also himself a poet, (dies) at Athens ; and Darius dies, and Xerxes [his] son reigns, CCX[XV]I years: Aristides being Archon at Athens. 490

51. Since Æschylus the poet first gained the victory in tragedy, and Euripides the poet was born, and Stesichorus the poet [went into] Greece, CCXXII years: Philocrates being Archon at Athens 486

52. Since Xerxes joined together a bridge of boats on the Hellespont, and dug through (Mount) Athos, and the battle was fought at Thermopylæ, and the sea-fight by the Greeks at Salamis, against the Persians, in which the Greeks were victorious, CCXVII years: Calliades being Archon at Athens 481

53. Since the battle at [P]latæa was fought by the Athenians against Mardonius, the general of Xerxes, in which the Athenians conquered, and Mardonius fell in the battle, and fire flowed [in Sic]ily round Ætna, C[C]XVI years: Xantippus being Archon at Athens.. 480

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54. Since [Ge]lon [the son] of *Dinomenes* became tyrant [of Syracuse,] CCXV years: *Timosthenes* being Archon at Athens. 479

55. Since *Simonides* [the son] of *Leoprepes* the Cean, who invented the art of memory, teaching [a chorus] at Athens, gained the victory; and the statues of *Harmodius* and *Aristogeiton* were erected, CC[XIV] years: [A]dimantus being Archon at Athens. 47[8]

56. Since *Hiero* became tyrant of Syracuse, CCVI[I]I years: *Ch[ar]es* being Archon at Athens. *Epicharmus* the poet lived also at this time. 472

57. Since *Sophocles* [the son] of *Sophillus*, who was of *Colonus*, (about ten stadia from Athens, Thucyd. 8, 67) gained the victory in tragedy, being XXVIII years of age, CCVI years: *Apsephion* being Archon at Athens. 470

58. Since the stone fell in *Ægos-potamus*; and *Simonides* the poet died, having lived XC years, CCV years: *Theagenidas* being Archon at Athens. 469

59. Since *Alexander* died, and his son *Pe[r]diccas* reigns over the Macedonians, CXCV[III] years: *Euthippus* being Archon at Athens. 462

60. Since *Æschylus* the poet, having lived LXIX years, died at [Gel]a in [Si]cily, CXCIII years: *Call[i]as* the first being Archon at Athens. 457

61. Since *Euripides*, being XLIII years of age, first gained the victory in tragedy, CLX[XIX] years: *Diphilus* being Archon at Athens. With *Euripides*, *Socrates* and [An]axagoras were contemporaries. [443]

62. Since *Archelaus* reigned over the Macedonians, *Perdiccas* being dead, C[LVI] years: *Astypilus* [being Arch]on at Athens. 420

63. Since *Dionysius* became tyrant of Syracuse, CXLIV years: *Euctemon* being Archon at Athens. 408

64. Since *Euripides*, having liv[ed] LXXVII years, di]ed, CXL[III] years: *Antigenes* being Archon at Athens. 407

65. Since *So[ph]ocles* the poet, having lived [XC]I

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years, died, and <i>Cyrus</i> went up into Persia, against his brother,] CXLII years: <i>Callias</i> the first being [Ar]chon at Athens.....	
66. Since <i>Telestes</i> the Seli[nuntian] gained the prize at Athens, CXXX[VIII] years: <i>Micon</i> being Archon at Athens.....	406
67. Since [those returned] who went up [with] <i>Cyrus</i> [into Persia,] and <i>Socrates</i> the philosoph[e]r, [having lived] LXX years, died, CXXXV[I] years: <i>Laches</i> being Archon at Athens.....	402
68. Since <i>Astydamas</i> first taught] at Athens, CXXXV years: <i>Aristocrates</i> being Archon at Athens	400
69. Since <i>Xanthus</i> a poet of Sard]is, gained the victory in dithyrambics, C... years: being Archon at Athens.....	399
70. [Sin]ce <i>Philoxenus</i> , a writer of dithyrambics, having lived LV years, dies, CXVI years: <i>Pytheas</i> being Archon at Athens.....	380
71. Since <i>Anaxandrides</i> , the comic [poet, gained the victory at Athens, CXIII years:] <i>Calleas</i> [being Archon] at Athens	377
72. Since <i>Astydamas</i> gained the victory at Athens, CIX years; <i>Asteius</i> being Archon at Athens. Then also [the great light] (or comet) blazed [in the sky.]	
73. [Since the battle at <i>Leuctra</i>] was fought between the Thebans and Lacedæmonians, in which the Thebans conquered, CVII years: <i>Phrasiclides</i> being Archon at Athens. [At this time, <i>Alexander</i> , the son of <i>Amyntas</i>] reigns [over the Macedonians]	371
74. Since <i>Stesichorus</i> the Himerian, the second of [that name,] gained the victory at Athens; and <i>Megalopolis</i> in Arcadia] was built, [CVI years: <i>Dyscinetus</i> being Archon at Athens]..	[370]
75. Since <i>Dionysius</i> , the Sicilian, died, and his son <i>Dionysius</i> became tyrant, and <i>Alexander</i> being dead, <i>Ptolemy</i> reigns [over the Macedonians,] CIV years: <i>Nausigenes</i> being Archon at Athens.....	368
76. Since the <i>Phoceans</i> [plundered the temple] of Delphi, [XCIV years:] <i>Cephisodorus</i> [being Archon at Athene]ns.....	358

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77. Since *Timotheus*, having lived XC years, died ; [and *Philip*, the son of *Amyntas*,] reigns [over the Ma]cedonians ; and *Artaxerxes* died ; and *Ochus* his son r[eigns over the Persians ; and] gained the victory ; XCIII years : *Agathocle[s]* being Archon at Athens. 357

78. [Since *Alexander*, the son of *Philip*, was bo]rn, XCI years : *Callist[ratus]* being Archon at Athens. [Aristotle the philo]sopher lived also at that [time] 355

79. Since *Ca[lippus]*, having slain *Dion*, became ty-
rant of Syracuse, XC year]s : [*Diotimus* being
Archon at Athens]..... 354

* * * * *

Note.—The valuable records of antiquity, whence the above is taken, were originally collected for THOMAS Earl of ARUNDEL, by Mr. *William Petty*, in the year 1624 ; they were deposited in the garden belonging to Arundel-house, in the Strand, where, during the civil commotions in Charles the First's time, they occasionally, in the absence of the family, suffered much injury ; insomuch so that this very chronicle is in part presumed to have been taken to repair a chimney : however, what remains of it, and the other marbles of the collection, are now deposited in a Museum, in the university of Oxford.

Besides the comments made upon them by the learned Selden, they have been well treated of by Dr. Chandler, Messrs. Price, Palmerius, Lydiat, Marsham, Dr. Prideaux, Dr. Playfair, M. Du Fresnoy, and Count Scipio Maffei.

STATUARY.

Its Origin.—Depending upon the joint and concurrent testimony of *Herodotus*, and *Diodorus Siculus*; first from their radically unimpeached characters, their consistency, and other historical virtues; had we not the light kindly lent from the labours of those eminent geographers, Monsieur *D'Anville*, and Major *Rennel*, who have established the authority of those Grecian historians beyond contradiction, in opposition to the phronism which *De Pau*, and others of his nation, would have raised: however, upon the testimony of those eminent historians, we found our belief that *Statuary*, or what we conceive to be its parent, *Modelling*, had its origin in Chaldea. The circumstance to which this allusion is made, has reference to those *three massy statues of pure gold*, erected to ornament the temple of *Jupiter Belus*. (Vide article *Astronomy*.) Those were erected about 2230 years before the Christian era.

There is also ample room to found rational belief that the most eminent and intellectual people, subsequent to the Chaldeans, were the Egyptians.

It is sufficiently well-known to all who are in the slightest degree conversant with the history of the arts, that the Egyptian artisans had from the very earliest periods been in the constant habit of constructing immense colossal statues of their multifarious deities, and also of their benefactors, raised from gratitude and adulation.

To name only a single instance, the immense colossal statue of *Memnon*, who perished before Troy, according to *Homer*;—also *Ovid*, who, speaking of his mother, *Aurora*, says :

“ Nor Troy, nor Hecuba could now bemoan,
“ She weeps a sad misfortune now her own;
“ Her offspring, *Memnon*, by *Achilles* slain,
“ She saw extended on the Phrygian plain.”

CROXALL.

Mr. Professor Flaxman has informed us, from *De Non*, that this celebrated statue, had it stood upright, would have measured $93\frac{1}{2}$ feet high: calculating from the dimensions of its ear, which *De Non* says is three feet long.

We are informed, from the general chronology furnished by Dr. Rees, in his *Cyclopædia*, that sculpture in *marble* was not introduced till about 873 years before Christ.

The Art.—The above named truly learned professor also informs us in one of his public lectures, “That sculpture in “Greece remained long in a rude state:” adding, “we “need not wonder at that, when we reflect that art is “only an imitation of nature: hence,” he urges, “it “follows, that man, in a rude state of nature, for want of “proper principles to direct his inquiries, and determine “his judgment, is continually liable to errors, physical, “moral, and religious:—all his productions of what kind “soever, partake of this primitive imbecility.

“The early arts of design, in Greece, resembled those of “other barbarous nations, until the successive intellectual “and natural, political and civil advantages of this peo-“ple raised them above the arts of surrounding nations. “The science employed by the Greeks in those arts may be “traced in anatomy, geometry, mechanics, and perspective. “From their earlier authors and coeval monuments. “*Homer* had described the figure with accuracy,—but insuf-“ficient for general purposes.

Of Anatomy.—“*Hippocrates* was the first who enu-“merated the bones, and wrote a compendious account of “the principles of the human figure; he described the “shoulders, the curves of the ribs, hips, and knees; the “characters of the arms and legs, in the same simple “manner in which they are represented in the *basso relieves* “of the *Parthenon*,” (now in the national gallery of the British Museum.)

“The ancient artists saw the figure continually exposed “in all actions and circumstances, so as to have little “occasion for other assistance to perfect their works; “and they had also the assistance of casting, drawing, and “other subsidiary means. The succeeding ancient anato-“mists did not describe the human figure more minutely “or advantageously for the artist, than had been done by “*Hippocrates*, until the time of *Galen*; whose external “anatomy gave example for that analytical accuracy of “arrangement followed by more modern artists. Sculpture, “however, profited little from *Galen*’s labours, for the “arts of design were in his time in a retrograde motion “towards anterior barbarism.

“The anatomical researches from *Alcmæon* of *Crotona*, “a disciple of *Pythagoras*, to those of *Hippocrates* and “his scholars, assisted *Phidias* and *Praxiteles*, their con-“temporaries and successors, in giving select and appro-“priate forms of body and limbs to their several divinities; “whose characters were fixed by the artists from the rhaps-

“ sodies of Homer, having then recently become popular
“ among the Athenians.

“ *Phidias* was the first in this reformation. *Minerva*
“ under his hand became young and beautiful, who had before
“ been harsh and elderly ; and *Jupiter* was awful, as when
“ his nod shook the poles, but benignant, as when he smiled
“ on his daughter *Venus*. *Apollo* and *Bacchus* then as-
“ sumed youthful resemblances of their sire ; the first more
“ majestic, the latter more feminine ; whilst *Mercury*, as
“ patron of gymnastic exercises, was represented as more
“ robust than his brothers. *Hercules* became gradually
“ more powerful ; and the forms of inferior heroes dis-
“ played a nearer resemblance to common nature ; from
“ which, both sentiment and beauty can alone be given to
“ imitative art. The near approach of ancient art to
“ nature, and considering their high advance to accuracy
“ of imitation, should likewise encourage the modern to
“ imitate the ancient artists. The moderns, now, also enjoy
“ superior auxiliary assistance from engraving, printed
“ books, &c. which the ancients did not possess.”

Mechanism of the Frame.—“ The human figure, with the
“ limbs extended, may be inclined and bounded by the circle
“ and square ; the centre of gravity, its change of situation
“ is susceptible of description, and may be exemplified in
“ rest and motion ;—running, striking, leaping, walking,
“ rising, and falling. Those principles of motion may be ex-
“ hibited in a skeleton, by the bending of the back-bone
“ backwards and forwards, whilst the limbs uniformly describe
“ sections of circles in their motions, constantly moving on
“ their axis.” The Professor then gives the **DIMENSIONS
OF THE HUMAN FIGURE**, as exhibited in Grecian statuary,
as follows :—“ The height, eight heads (or usually ten faces) ;
“ two heads across the shoulders ; one head and a half
“ across the hips ; three noses, the thickest part of the
“ thigh ; two, to the calf of the leg ; one, the narrowest
“ part of the shin, &c. The above is the general propor-
“ tions of the male figure. The female figure is narrower
“ across the shoulders, and wider across the hips, than the
“ male.

“ The **BEAUTY** in the human figure is found in its
“ proportion, symmetry, and expression ; it really appears,
“ that the beauty of the human figure is the chief or ulti-
“ mate of beauty observed in the visible works of creative
“ Omnipotence. From thence every other species of beauty
“ graduates in just *ratios* of proportion : from considering
“ the intellectual faculties of man,—we assimilate the idea,

“ and connect beauty with utility ; as this union of his physical and mental powers unquestionably renders him one of the most beautiful objects in the creation. This consideration leads us involuntarily to a train of thought, suggested by a principle laid down by PLATO, ‘ *That nothing is beautiful, which is not truly good* ;’ which also induces the following conclusive corollary, and which is confirmed by reason, and sanctioned by revelation, that ‘ **THE PERFECTION OF HUMAN BEAUTY CONSISTS OF THE MOST VIRTUOUS SOUL IN THE MOST HEALTHY AND PERFECT BODY.**’

“ Inasmuch as painters and sculptors adhered to those principles in their work, they assisted to enforce a popular impression of divine attributes and perfections, even in ages of gross idolatry.

“ In the highest order of divinities, the energy of intellect was represented above the material accidents of passion and decay.

“ The statues of the Saturnian family, *Jupiter*, *Neptune*, and *Pluto*, were the most sublime and mighty of the superior divinities : *Apollo*, *Bacchus*, and *Mercury*, were youthful resemblances of the Saturnian family in energetic, delicate, and more athletic beauty : *Apollo-Belvidere* supplies *Homer*’s description to the sight ; he looks indignant ; his hair is agitated ; he steps forward, in the discharge of his shafts ; his arrows are hanging on his shoulder.

“ A youthful and infantine beauty of the highest class distinguish the *Cupid* of PRAXITELES, and the group of *Ganymede and the Eagle*. The order of heroes or demigods excel in strength, activity, and beauty ; *Achilles*, *Ajax*, *Hæmon*, *Zethos*, and *Amphion*, are examples in Grecian statuary to establish this remark. *The train of Bacchus* consists of *Silenii*, *Fauns*, *Satyrs*, *Bacchantes*, and *Priests*.

“ The *Giants* are human to the waist ; their figures terminate in serpentine tails. *Ocean* and the *great Rivers* have Herculean forms, and faintly resemble the Saturnian family, and have reclining positions. The *Tritons* resemble the *Fauns* in their heads and upper features, with finny tails and gills on their jaws ; their lower parts terminate in tails of fish.

“ In the highest class of female characters, the beauty of *Juno* is imperious ; that of *Minerva*, wise, as she presides over peaceful arts ; or *warlike*, as the protectress of cities. *Venus* is the example and patroness of milder beauty and the softer arts of reciprocal communication ; of which, the *Venus Praxiteles* and *Venus de Medicis* are

" instances. The Greeks had also a *Venus Urania*, the goddess of hymæneal rites and the celestial virtues.

" The *Graces* are three youthful lovely sisters, embracing: they represent the tender affections, as their name implies; while their character gives the epithet *graceful* to undulatory and easy motion. As all the universe was peopled by genii, good and evil dæmons, which comprehends every species and gradation from the most sublime and beautiful in *Jupiter* and *Venus*, to the most gross in the *Satyr*, resembling a goat, and in the terrific *Pan*."

The preceding comes from one of the best informed and most unquestionable of authorities; and since the public have now an opportunity of judging for themselves, by consulting many of the objects to which the learned Professor refers; (as the wisdom of our legislature has had an opportunity of making those objects national property, they are accordingly deposited in our great national gallery, in the *British Museum*;)—to those objects themselves, the public are, therefore, respectfully referred for internal conviction.

The progeny of Cham, or Ham, the son of Noah, we find peopled Egypt, Medea, Chaldea, Phœnicia, and several other adjoining countries. It will be remembered, that the posterities of two of the three sons of Noah, possessed these countries which the folly of idolatry overflowed; whilst it was in the line of Shem alone that the true faith was continued. The *Mosaic* narrative is chiefly descriptive of events which occurred in the posterity of that patriarch, because, from it, the righteous line of the faithful in *Abram*, *David*, *Solomon*, and ultimately *Christ* proceeded. Thus infinitely more than two-thirds of the world, in the original proportion, were gross idolaters: we often find the Omniscience of the Highest forewarning the sacred line to avoid its fascinations. Nay, when, upon more occasions than one, the descendants of the faithful forgot themselves, and those admonitory precepts of the Creator were neglected, we find the sacred race flying before the face of puny foes, which defeat was declared to be from their having prostrated themselves before *strange gods*; they were bowed thus low in battle. Not to mention their disobedience immediately beneath mount *Sinai*, which protracted their journey through the wilderness to forty years, which, perhaps, under other circumstances, would not have required forty days, or at most weeks. All these troubles, their subsequent captivities, and national afflictions, were the produce of disobedience. This is one of those means which retributive justice resorts to, to punish wilful sin: so, however, it was with the seed of Abraham. And so it is presumed to be with the present race of men; either

immediate or remote punishment constantly vindicates the Omnipotence of Heaven. From the frequent maledictions we discover in the sacred volume against idol worship, we cannot doubt that it was peculiarly offensive to the Deity. That the great majority of the world were addicted to this proscribed practice, is also equally certain. And as the Spirit of Truth had declared in the *decalogue*, that “It would “ not be worshipped under *any form* in the heavens above, “ in the earth below, or in the waters under the earth;” so was image-worship, and consequently the construction of such things, forbidden.

We discover that as this mania infected all nations, tongues, and people, so did not the Israelites escape it; but immediately after their *exode* from Egypt, we discover an exact similitude of the *sacred calf*, *Apis*, of the Egyptians, cast in melted gold, which they constructed below Mount Sinai. In Egypt, metallic statues, as well as those of stone, must have existed anterior to that event, as they actually had done to our own knowledge; and long before idolatry had made its appearance in Egypt it had existed in *Chaldea*, as previously shown.

As that worship had first its being in Chaldea, so had the art of statuary its origin in that country: it was improved, perhaps, in Egypt, and perfected in Greece, from the time of *Pericles* to that of *Alexander*, commonly called the Great.

DRAWING.

The Human Figure. — From what has appeared in the last article, it should seem that drawing of the figure was nearly coeval with the art of statuary, or, perhaps, anterior to it in Greece. As there is ample room to suppose the rude aboriginal inhabitants of Greece borrowed their arts, as they did their religious and civil policy, from the Egyptians, and in fact from every nation where they discovered any thing worthy their attention; so must we suppose they had also this art, in its infancy it is true, from the same people. Indeed, reflecting for a single moment, we are fully satisfied that the origin of the art we now contemplate, came from Egypt. *Diodorus Siculus* expressed himself with great truth, when he said, “ *Necessity was man's first instructor.*” We accordingly perceive the *necessity* of the earliest inhabitants of Egypt to exercise the art of drawing, they having determined, perhaps for want of better means, to record their transactions by *hieroglyphical representation*. We have not

the slightest doubt but we now have in our national establishment, the British Museum, some of the earliest specimens of Egyptian hieroglyphical delineation, in the *sarcophagi*, No. 1, room the ninth, (which monument has engaged our serious attention for *five successive years*:) from its hieroglyphical inscription, we have discovered that that identical monument is no less than 3579 years old!

Anterior to this date, we are, therefore, certain the art of drawing must have existed. Being satisfied of its date, from the circumstance of our having discovered the name of the identical hero to whom it was inscribed.

Like its sister art, sculpture, it received every improvement of which it was susceptible, from the mature conceptions and the delicate hand of Grecian artizans; words are, perhaps, inadequate to convey this art to a second person. Years of incessant labour, with an attention to principles established and found to correspond correctly with nature, are the only means to obtain a just knowledge of its principles, and to judge tastefully of its correct execution.

However, in addition to the rules which have appeared in the preceding article, we add the following, with some additions in detail from a note in *Mason's edition of Du Fresnoy*, and which was approved by *Sir Joshua Reynolds*:—

1st. That from the *crown* of the *head* to the *forehead* is the *third part* of a *face*.

2d. The *face begins* at the *root of the lowest hairs* that grow on the *forehead*, and *ends* at the bottom of the *chin*.

3d. The *face* is divided into three proportionate parts; the first, contains the *forehead*, (or *brow*); the second, the *nose*; and the third, the *mouth and chin*.

4th. From the *chin* to the *pit between the collar-bones*, is two lengths of a *nose*.

5th. From the *pit between the collar-bones*, to the *bottom of the breast*, one *face*.

6th. From the *bottom of the breast* to the *navel*, one *face*.
Note.—The *Apollo* has one *nose* more: and the upper half of the *Venus* is to the lower part of the *belly* only, and not to the *privities*.

7th. From the *navel* to the *genitories*, one *face*. The *Apollo* has also one *nose* more.

8th. From the *genitories* to the *upper part of the knee*, two *faces*.

9th. The *knee* contains half a *face*.

10th. From the *lower part of the knee* to the *ankle*, two *faces*.

11th. From the *ankle* to the *sole of the foot*, half a *face*.

12th. A man with his arms extended, is, from his longest finger on each hand, as broad as he is long. *Vide* Mr. Professor Flaxman's idea of the square the figure forms, and of its being bounded by a circle,—in the last article.

13th. From one side of the breast to the other, two faces.

14th. The bone of the arm, called *humerus*, i. e. from the shoulder to the elbow-joint, is the length of two faces.

15th. From the end of the elbow to the joint of the little finger, the bone called *cubitus*, with a part of the hand, is also two faces.

16th. From the box of the shoulder-blade to the pit between the collar-bones, one face.

17th. To be satisfied in measures of breadth. From the extremity of one finger to the other, so that this breadth should be equal to the length, it should be observed, that the bones of the elbows with the *humerus*, and the *humerus* with the shoulder-blade, or *scapula*, bear the proportions of a face, when the arms are extended.

18th. The sole of a foot is one sixth part of the length of the entire figure.

19th. The hand is the length of a face.

20th. The thumb contains a nose in length.

21st. The inside of the arm, from the place where the muscle disappears, which is connected with the breast (called the pectoral muscle), to the middle of the arm, four noses long.

22d. From the middle of the arm, at the top, to the beginning of the head, five noses.

23d. The longest toe is one nose.

24th. The outermost parts of the paps, and the pit between the collar-bones, of a female, form an equilateral triangle.

Thus far *Du Piles*.

The knowledge of the preceding proportions are, as mere rudiments, essential to the delineation of the human figure; but they relate to a body in a quiescent state only. The more difficult task remains, to become thoroughly acquainted with its actions. To obtain this, a rudimental and even an intimate acquaintance with the skeleton, and assiduous and incessant practice are necessary.

However, the present Professor of Anatomy to the Royal Academy has, in his annual lectures, furnished us with the probable extent to which the motions of the frame may be carried.

First, premising that the motions of the head and trunk of the body are limited by the several joints of the spine.

2d. The motion of the whole body upon the lower limbs takes place at the hip-joints, at the knees, and at the ankles.

3d. Those limbs called great limbs (the whole frame being technically divided, and denominated the upper and lower extremities,) have rotary motions at their junctions with the trunk, by means of a ball and socket joints, at the shoulders and the hips. The analogy of parts between the upper and lower extremities is not carried through the structure of those limbs in the body.

4th. The *fulcrum* of the upper limb is itself moveable, upon the trunk, as appears from the extensive motions of the *scapula*, which so generally accompany the rotation of the shoulder, and supply the limb with a great variety of motion, much more than the lower limb possesses.

5th. The junction of the thigh with the mass without motion, called the *pelvis*, limits its rotation to the ball and socket-joint without farther extension.

6th. The rotation of the head and neck takes place at the joint between the first and second *vertebræ*.

7th. When the nose is parallel with the *sternum*, the face may be turned towards either shoulder, through an angle of 60° on each side; the whole range of its motion is 120° .

8th. The lateral bending of the neck is equally divided between the seven *vertebræ*; but the bowing of the head, and violently tossing it backward, are chiefly effected at the joint of the skull, and the first bone of the vertebral column called the *atlas*.

9th. Although the preceding motions are consistent with an erect stature of the neck, yet the lateral motions demand a curvature of its whole mass.

10th. The movements of the trunk are regulated by rotary and lateral motions, nearly equally divided among the several joints of the *vertebræ* of the back and the loins.

11th. The joints of the *dorsal* or back *vertebræ* are, notwithstanding, more close and compact than those of the loins; allowing of a wider range for bending and turning in the loins than the back.

12th. The *sternum* and ribs move upward, to assist the chest in the expansion required for respiration; drawing the *clavicles* and the shoulders upwards in full inspiration, and tend to a contrary motion on expiration. Such movements, also, characterize strong action and certain passions, and are very apparent in a naked figure.

13th. In stooping to touch the ground, the thigh-bone forms an angle of somewhere about 55° with the average direction of the *vertebrae*.

14th. The leg bends upon the thigh at an angle of about 75° , and the line of the *tibia* forms with the sole of the foot, when that is elevated, an angle of 65° .

15th. The whole of this limb is susceptible of motion at the hip-joint forwards, to a right angle with its perpendicular position; and backwards to an angle of 20° . The leg will then continue to move by itself, to its own angle of 75° with the thigh. Its external motion does not exceed 45° .

16th. When the shoulders are quiescent, the *clavicles* usually meet in an angle of 110° at the *sternum*.

17th. The utmost elevation of the upper joint of the arm generally forms an angle of 155° with the *vertebræ*, and about 125° with the line of its *clavicle*. The flexion of the fore-arm upon its upper part is confined to an angle of nearly 40° .

18th. The whole arm is capable of moving forward or outward through nearly 80° , and backwards to nearly the same angle with its perpendicular station.

19th. The actions of pronation and supination in the hand, range through all intermediate degrees from an horizontal or perpendicular direction to 270° ; but 90° of its rotary motion in pronation comes from the shoulder-joint.

20th. The palm of the hand admits of flexion and extension to 65° in each direction; its lateral motions are 35 outward, and 30 inward. The flexion of the fingers at each phalanx is a right angle.

General Observations. — In drawing the joints, very considerable difference is found in their length from inequality of action. The elbow-joint, when bent inwards, lengthens the arm nearly $\frac{1}{8}$ th; the same general law operates on the knees, fingers, &c. When a man is at rest, and standing on both feet, a line drawn perpendicularly between the *clavicles* will fall central between his feet. Should he stand on one foot, it falls upon the heel of that foot which supports his weight.

If he raises one arm, it will throw as much of his body on the other side, as nature requires to support the equilibrium. One of his legs thrown back brings the breast forward, to preserve the gravity of the figure: the same will be observed in all other motions of the parts to keep the central gravitation in its proper place.

The equipoise of a figure is of two sorts: *simple*, when its action relates to itself; and *compound*, when it refers to a second object.

The equilibrium of nature is constantly preserved; for in

walking, leaping, running, jumping, &c. similar precautions are taken: by the flexibility of our bodies in striking, according to the proportionate force meant to be employed, the body is first drawn back, then the limb propelled forward, bringing with it the weight of the body.

In striking, lifting, throwing, &c. a greater proportion of force is employed than may be necessary to effect the intended purpose: this is mentioned, because, in representation, the force employed in an action should be marked in the muscle producing that action; if it be marked rather stronger than may be necessary, the cause is obvious, for nature so employs her powers.

In drawing,—pupils should have selected for them the best examples to copy from, at first; then they should draw from the figure as soon as possible, and if it be practicable, from the best specimens of the antique. Their first drawings are recommended to be made with chalk, and in large proportion; attention to these will communicate ease and freedom to their future performances.

It will be likewise found necessary for them to draw upon geometrical principles; this communicates a truth which greatly adds to their certainty and confidence, and ultimately to their ease.

This is mentioned because it will be found, that there is no portion of the frame, quiescent or in an active state, but what is susceptible of geometrical definition.

Experience and exercise communicate truths which produce certainty, whence come ease and grace.

THE THIRD PERIOD.

MILLS.

CORN-MILLS.—We have previously spoken upon this article, but enlarge upon what has been already said, by offering such additional circumstances as have come within our recollection or research, upon the most ancient customs: to which we subjoin such modern improvements our best information furnisheth us with, as the more advanced state of the arts have enabled the moderns to achieve objects that excel the imperfect information of the ancients in mechanical sciences.

In addition to the preparation of fine *meal*, by *Abraham*,¹ for his divine guests, formerly mentioned, we may add that it certainly does appear in a subsequent text,² that *manna* was ground like corn. The earliest instrument for this purpose appears to have been the *mortar*, which was retained long after the introduction of mills, properly so called: because they were most probably, at first, very imperfect.³ In process of time the mortar was made ridged, and the pestle notched at the bottom; by which means the grain was rather grated than pounded.

A passage in *Pliny*,⁴ which has not yet had a satisfactory interpretation, renders this conjecture probable. In time, a handle was added to the top pestle, that it might be more easily driven round in a circle, when this machine, at first called *mortarium*, by this means assumed the name of a hand-mill. Such a mill was called by the name formerly given, *meta*, or *mola trusatilis, versatilis, manuaria*,⁵ from *rubbing backwards and forwards*; and varied but little from those used by our colour-grinders,⁶ apothecaries, potters, and other artisans. From expressions in the sacred volume we may rationally infer, that it was customary to have a mill of this sort in every family: *Moses* having forbidden to take such instruments for a pledge; for that, says he, “No man shall take the nether or the upper millstone to pledge: for he taketh a man’s life to pledge.”⁷ It is observed by *Michaelis*, on this passage, that a man could not then grind, consequently could not bake the necessary daily bread for his family.

¹ Genesis, ch. xviii. v. 6.

² Numbers, ch. xi. v. 8.

³ Ολμον μεν τριποδην ταμνειν, ὑπερον δε τριπαχυν.—Hesiod. Opera et Dies, 421.

Mortarium quidem tripedale seca, pistillum vero tricubitale.

It, therefore, appears that both the mortar and pestle were then made of wood, and that the former was three feet high; although it is not expressly said, that this mortar was for the purpose of pounding corn. The mortar was called ὥλμος, *pila*; the pestle, ὑπερος or ὑπερον, *pistillus* or *pistillum*; to pound, μασσειν, *pinsere*, which word as well as *pinsor*, was retained afterwards, when mills came into regular use. *Servius ad Virg. An.* i. 179. *Majores molarum usum non habebant. Frumenta torrebant, et ea in pilas missa pinsebant, et hoc erat genus molendi. Unde et pinsores dicti sunt, qui nunc pistores vocantur.* *Plin. lib. xviii. c. 3.*

⁴ *Pistura non omnium facilis; quippe Etruria spicam farris tosti, pisente pilo præferrato, fistula serrata et stella intus denticulata, ut nisi intenti pisant, concidunt grana, ferrumque frangatur. Major pars Italiae ruido utitur pilo.* *Plin. xviii; 10. ii. p. 111;* which passage *Gesner* has endeavoured to elucidate in his *Index to the Scriptores rei rusticæ*, p. 59.

⁵ *Plautus ob quærendum victum ad circumagendas molas quæ trusatiles appellantur, operam pistori locasset.* *Gellius, iii. c. 3.*

⁶ *Consult Hartwig (Sprengels) Handwerke und Künste, xiii. p. 125. plate 4, fig. 12, and Wallerius, Physische chemie, i. p. 62.*

⁷ *Deuteronomy, ch. xxiv. v. 6.*

Grinding was then the employment of women, particularly of female slaves, as at present in those countries which are uncivilized: the portion of strength required for the operation, therefore, could not have been great;⁸ but afterwards the mills were driven by bondsmen, whose necks were placed in a circular machine of wood, so that they could not put their hands to their mouths or eat of the meal.⁹ This must have been an intervening link between the hand and horse-mill.

In course of time shafts were added to the mill, that it might be driven by cattle, which were then blindfolded.¹⁰ The first cattle-mills were called *molæ jumentariae*, which had, probably, only a heavy pestle like the hand-mills; but it is conjectured that it must have been soon remarked, that the labour would be more easily accomplished, if, instead of the pestle a large heavy cylinder was employed. A competent judge has, however, believed that the first cattle-mills had not a spout or trough as ours have; at least those hand-mills *Tournefort* saw at *Nicaria*, consisted only of two stones; but the meal issued through an opening in the upper one, and fell upon a board or table, on which the lower one rested.

The upper mill-stone they called *meta* or *turbo*; and the lower one *catillus*: the name of the first also signified a cone with a blunt apex, whence it has been thought by some, that corn was first rubbed into meal, by rolling one stone upon another, as painters now grind colours with a mullet. This is not improbable, as present practice among barbarous people fully proves. It is also apparent, that the upper millstone was substituted for the pestle, which action may have lent it a name, when they called it *meta*.

Mr. Professor Beckmann has followed A. F. Gori¹¹ in

⁸ When Moses threatened Pharoah with the destruction of the first-born of Egypt, it was expressed in these terms:—"All the first-born in the land of Egypt shall die, from the first-born of Pharoah, that sitteth upon the throne, even unto the first-born of the maid-servant that is behind the mill." Exodus, ch. xi. v. 5. Vide also *Homeri Odyss.* vii. 103, and xx. 105.

⁹ The name which Pollux gives to this machine is *παυσικαπη*.

¹⁰ The oldest cattle-mills, in the opinion of Beckmann, resembled the oil-mills represented in the 25th plate of *Sonnerats Reise nach Ostindien und China*, i. Zurich, 1783, 4to. To the pestle of a mortar made fast to a stake driven into the earth, is affixed a shaft, to which two oxen are yoked. The oxen are driven by a man, and another stands at the mortar to keep the corn under the pestle. Sonnerat says, that with an Indian hand-mill, two men can only grind about sixty pounds weight of flour per day; whilst one of our mills, directed by one man only, can grind above a thousand.

¹¹ *Memorie di varia erudizione della Societa colombaria Fiorentina.* In Livorno, 1752, 4to. vol. ii. p. 207. *Osservazioni del proposto A. F. Gori, sopra un' antica gemma anulare rappresentante, &c.*

his description of an antique gem, engraved on red jasper, upon which appears “The naked figure of a man, “ who in his left hand holds a sheaf of corn, and in the “ right a machine that in all probability is a hand-mill. “ Gori considers the figure as a representation of the god “ Eunostus, who, as Suidas says,¹² was the god of mills. “ The machine, which Eunostus seems to exhibit, or to be “ surveying himself, is, as far as one can distinguish (for “ the stone is scarcely half an inch in size), shaped like a “ chest, narrow at the top, and wide at the bottom. It “ stands upon a table, and in the bottom there is a perpen- “ dicular pipe, from which the meal, represented also by “ the artist, appears to be issuing. Above, the chest or “ body of the mill has either a top with an aperture, or “ perhaps a basket sunk into it, from which the corn falls “ into the mill. On one side, nearly about the middle of “ it, there projects a broken shank, which, without over- “ straining the imagination, may be considered as a handle, “ or that part of the mill which some called *molile*. Though “ this figure is small, and though it conveys very little idea “ of the internal construction, one may, however, conclude “ from it that the roller, whether it was of wood or of iron, “ smooth or notched, did not stand perpendicularly, like “ those of our coffee-mills, but lay horizontally; which “ gives us reason to conjecture a construction more inge- “ nious than that of the first invention. The axis of the “ handle had, perhaps, within the body of the mill, a crown- “ wheel, that turned a spindle, to the lower end of the “ perpendicular axis of which the roller was fixed. Should “ this be admitted, it must be allowed also, that the hand- “ mills of the ancients had not so much a resemblance to “ the before-mentioned colour-mills as to the philosophical “ mills of our chymists; and Langelott, consequently, will “ not be the real inventor of the latter. On the other side, “ opposite to that where the handle is, there arise from the “ mill of Eunostus two shafts, which Gori considers as “ those of a besom and a shovel, two instruments used in “ grinding; but as the interior part cannot be seen, it “ appears to me doubtful whether these may not be parts “ of the mill itself.”

In the commencement of the last century, the remains of a pair of Roman mill-stones were found at *Adel*, in *Yorkshire*; described by *Thoresby*, in the *Philosophical*

¹² Ευνοσος θεος τις φασιν επιμυλιος. Eunostus, deus quidam, ut aiunt, molarum praeses.

Transactions abridged, published by Jones, London, in 1731, n. 282, p. 1285, comprising the series from 1700 to 1720, ii. p. 38. One of the stones, twenty inches in breadth, is thicker in the middle than at the edge, consequently one side convex; the other was of the same size, but as thick at the sides as the other was in the centre; the traces of notching were discoverable.

Enough may, perhaps, have been said concerning this original invention; therefore this article will not be encumbered with quotations of all those passages relative to mills which are found in ancient authors, as they would, perhaps, afford but little additional information. Neither will mythological records be disturbed to inquire to which deity or hero the invention was originally attributed; or to ascertain the descent of *Milantes*, whom *Stephanus* distinguishes by that honour; or how those mill-stones were constructed which are alleged to have been built by *Myletes*, son of *Lelex*, king of *Laconia*; but we shall proceed to the invention of WATER-MILLS.

These appear to have been introduced about the period of *Mithridates*, contemporary with *Caesar* and *Cicero*. *Strabo* relating that there was a water-mill near the residence of the *Pontian* king, that honour has been ascribed to him; but so far is this remote from certainty, that nothing can be inferred from thence, other than that water-mills at that period were known in Asia. *Pomponius Sabinus* informs us, in his remarks on a poem of *Virgil's*, intituled *Moretus*, that the first water-mill, seen at *Rome*, was erected on the banks of the *Tiber*, a little before the time of *Augustus*; ¹³ but of this there is no other proof than his simple assertion: he having taken the greater part of his remarks from the illustrations of *Servius*, he must have had a more perfect copy of that author than any now remaining, and from these his information might have come.

The most certain proof we have that *Rome* had water-mills in the time of *Augustus*, is, that *Vitruvius* has told us so; but those mills were not corn-mills, they were *hy-*

¹³ *Pomponius Sabinus* also adds information more important than we have yet mentioned, when he says, — “ *Usus molarum ad manum in Cappadocia inventus*; “ *inde inventus usus earum ad VENTUM et ad equos. Paulo ante Augustum*. “ *MOLÆ AQUIS actæ Romæ in Tiberi primum factæ, tempore Græcorum, cum for- nices diruissent.*”

From whence we collect that hand-mills for grinding of corn were first invented in Cappadocia; that they were introduced to *Rome* from *Greece*, with wind-mills, by one *Paulo*, before the time of *Augustus*, with the usual sacrifice before grinding; the first being built upon the banks of the *Tiber*.

draulic engines, which he describes in his works, b. x. c. 10. From whence we learn that the ancients had wheels for raising water, which were driven by being trod upon by men; the usual employment for criminals, as may be learnt from *Artemidorus*, lib. i. c. 50, and *Sueton. Vita Tiber. c. 51.* *Uno ex his equestris ordinis viro et in antliam condemnato.* Also from a pretty epigram of *Antipater*: “Cease your work, ye maids, ye who laboured in the mill; “sleep now, and let the birds sing to the ruddy morning; “for Ceres has commanded the water-nymphs to perform “your task: these, obedient to her call, throw themselves “on the wheel, force round the axle-tree, and by these “means the heavy mill.” This *Antipater*, as we are informed by *Salmasius*, and with every appearance of truth, lived at the period of *Cicero*. *Palladius* also, with equal clearness, speaks of water-mills, which he advises to be built on estates where is running water, in order to grind corn without men or cattle. Other passages of the ancients are also presumed to allude to those mills; among which, this verse in *Lucretius*:

Ut fluvios versare rotas atque hausta videmus.

It likewise appears that the water-wheels to which *Helio-gabalus* directed some of his friends and parasites to be tied, cannot be considered to be mills for the purpose of grinding corn; for these, as well as the *hausta* of *Lucretius*, were probably like those machines for raising water which are spoken of by *Vitruvius*, as *hydraulæ*.

It is, however, on the authority of *Pomponius Sabinus*, before cited, that both wind and water mills were known to have been in Italy, and even the latter in Rome, in the days of *Augustus*. However, about twenty-three years after the demise of *Augustus*, when *Caligula* seized every horse from the mills, to convey effects he had in contemplation to take from Rome, the public were much distressed for bread; whence *Beroaldus*, with justice infers, water-mills must have been very rare. Even 300 years after *Augustus*, cattle-mills were so common in that city, that their number amounted to 300; mention of them, and of the hand-mills, often occurs for a long time after. It is not their use we inquire after, it is enough for us to know they had being.

We now come to another period, when we are informed *public mills* were first introduced; which occurs under *Honorius* and *Arcadius*, A. D. 398, mention being made of them in that year; and which also clearly shows they were then newly established: which establishment was found

necessary to be protected by laws made in their favour. The orders for that purpose were renewed more than once, and made more secure by *Zeno*, towards the end of the fifth century.¹⁴ It may be properly remarked, that in the whole code of *Justinian*, the least mention of wooden pales, or posts, is not made; which occurs in all the new laws, and which it appears, when there were several mills on the same stream, occasioned so many disputes then, as well as in after times. The mills at Rome were erected on those canals which conveyed water to the city; because these were employed in several arts and for many purposes, it was ordered, that by dividing the water, the mills should be always kept going. The greater part of them lay under *Mount Janiculum*;¹⁵ but as they were driven by so small a quantity of water, they probably executed very little work; and for this reason, but chiefly on account of the great number of slaves, and the cheap rate at which they were maintained, these noble machines were not so much used, nor were so soon brought to perfection, as under other circumstances they might have been. It appears, however, that after the abolition of slavery, they were much improved and more employed; and to this a particular incident seems, in some measure, to have contributed.

When *Vitiges*, king of the Goths, besieged *Belisarius* in Rome, A. D. 536, and caused the fourteen large expensive aqueducts to be stopped, by which the city was subjected to great distress; not from the want of water in general, because it was secured against that inconvenience by the Tiber; but by the loss of that water which the baths required, and, above all, of that necessary to drive the mills, which were all situated on these canals. Horses and cattle, which might have been employed in grinding, were

¹⁴ Cod. Theodos. lib. xiv. tit. 15, 4; and Cod. Justin. lib. xi. tit. 42, 10. Many things relating to the same subject may be found in *Cassiodorus*—Dicitur, *commodi causa privati, aquam formarum, quam summo deceret studio communiri, ad aquæ molas exercendas vel hortos irrigandos fuisse derivatam. Turpe hoc et miserabile in illa urbe fieri, quod per agros vix deceret assumi.* *Cassiodori Opera.* Genevæ, 1650. 4to. p. 104.

¹⁵ *Procopius, Gothicorum, lib. i. c. 9.*

Quæ regio gradibus vacuis jejunia dira.
Sustinet? aut quæ Janiculi mola mota quiescit?

Prudentius contra Symmachum, lib. ii. 948.

It is added in a note on this passage: *Janiculus mons est ubi templum Jani erat, et multæ molæ constructæ. Compare R. Fabretti Diss. tres de Aquis et Aquæductibus veteris Romæ, n. 347, p. 176. See also Grævii Thesaur. Antiq. Rom. iv. p. 1677.*

not to be found : but *Belisarius* fell upon the ingenious contrivance of placing boats upon the Tiber, on which he erected mills that were driven by the current. This expedient was attended with complete success ; and as many mills of this kind as were necessary were constructed. To destroy these, the besiegers threw into the stream logs of wood, dead bodies, &c. which floated down the river into the city ; but the besieged, by making use of booms, to stop them, were enabled to drag them out before they could do any mischief. This seems to have been the origin of *floating mills* ; no record of them appearing before. By these means the use of water-mills became very much extended ; for floating mills can be constructed almost upon any stream, without forming an artificial fall ; they may be stationed at the most convenient places, and they rise and fall of themselves with the water. They are, however, attended with these inconveniences ; they require to be strongly secured ; they often block up the stream too much, and move slowly ; and they often stop when the water is too high, or when frozen.

After this improvement, the use of water-mills was never laid aside or forgotten, but was soon made known all over Europe ; and passages might be quoted, *ad infinitum*, in every century, to prove their continued use. The Roman, Salic, and other laws constantly provided for the security of these mills, which they call *molina* or *farinaria* ; and define a punishment for such who destroy the sluices, or steal the mill-irons (*ferramentum*). It is said, however, that there were water-mills in France and Germany a hundred years before these laws had existence.

TIDE-MILLS.—At Venice and other places, there were erected mills which regulated themselves by the motion of the waters, and were worked by the ebbing and flowing of the tide, and which every six hours changed the motion of their wheels. Of this species of mills, a new invention, or perhaps, rather an improvement of it was made in London, called a *tide-mill* ; which may be seen in “**The Advancement of Arts, Manufactures, and Commerce,**” by **W. Bailey. Lond. 1772.**

Zanetti is said to have shown, by some old charters, that such mills existed about the year 1044 ; but with still more certainty in 1078, 1079, and 1107.

It appears, however, that hand and cattle mills were in most places retained, after the use of proper water-mills, particularly in convents: They were used, because the otherwise lazy monks found the exercise they afforded beneficial

to their health. Likewise the legends of popish mythology are full of the miracles which have been wrought at these mills.

A modern author of credit impeaches the veracity of *Pomponius Sabinus*, after he had previously quoted his authority, and likewise after he had said he bore a good character, in a popular work ; by charging him with improbability, nay, positive falsehood, and alleging that the Romans had no *wind-mills*. It should be noticed, without venturing to decide upon the point, that he has adduced no authority for such allegation, and that he only concludes so by inference, as upon the authority of *Vitruvius* ; that mechanist, he says, in enumerating all moving forces, does not mention *wind-mills*. But, for the sake of candour, was not the one as liable to err as the other ? He also says, that neither *Seneca* or *St. Chrysostom* mention *wind-mills* ; and is unmercifully severe upon an old Bohemian annalist, who speaks of *wind-mills* so early as 718. But he is all along bringing his forces to prove, that *wind-mills* had first existence in his own district, *Germany* ; that they were there invented ; and, perhaps, because he is of that country.

Mabillon mentions a diploma of the year 1105, in which a convent in France is allowed to erect water and wind mills, *molendina ad ventum*.

Bartolomeo Verde proposed to the *Venetians*, in 1332, to build a *wind-mill*. When his plan had been examined, he had a piece of ground assigned him, which he was to retain if his undertaking succeeded within a specified time. In 1733, the city of *Spires* caused a *wind-mill* to be erected, and sent to the *Netherlands* for a person acquainted with the method of grinding by it, as may be learnt from *Lehmanns Chronica der Stadt Speyer, Franckf.* 1662. A *wind-mill* was also constructed at *Frankfort*, in 1442 ; but it does not appear to have been ascertained whether there were any there before.

About the time both *wind* and *water mills* became more general, in the pontificate of *Gregory*, about the twelfth century, a question arose whether mills were *tytheable* ? The dispute existed for some time between the persons possessed of mills and the clergy ; when neither would yield : at length, upon it being referred to the *Pope* and *Sacred College*, the question was, (as is usual when interested persons are made arbitrators,) determined in favour of the claims of the church.

There was one inconvenience attending *wind-mills*, which

might be obviated in other mills : the mill was useless unless the wind was in a particular direction. To remedy this, various modes were tried ; at first, the mill was fixed on a floating body in the water, which might be turned to any wind. The next improvement consisted in turning the body of the mill to meet the direction of the wind ; this was effected by two modes: first, the whole building is constructed in such a manner as to turn upon a post below : this method is said to have been invented in Germany, and is called the *German mode*: second, the building is formed so as to turn the roof, with the shafts supporting the sails only ; this is called the *Dutch method*, and was invented by a *Fleming* about the middle of the sixteenth century, as may be found in *De Koophandel van Amsterdam, door Le Long.*

Allthough in the earliest ages of the world men might have been, perhaps, satisfied with having their corn reduced to a mealable form alone ; yet after this had been with care effected, then they thought of improving upon this conveniency, and separating the farinaceous part from the bran and husks. This was certainly desirable, therefore at first they bolted it in a sieve with a long handle attached to it, with a hair or fine lawn lining ; this was common in this country till within the last forty years ; but by degrees, opportunities of improvement in the mechanism of mills suggested to some mechanic the idea of constructing what is now called *bolting mills*, applied to the mill for grinding, and wrought at the same time by appropriate machinery.

It appears that sieves of horse-hair were first used by the *Gauls*, then those of linen by the *Spaniards*. The mode of applying a sieve in the form of an extended bag to catch the meal as it fell from the stones, and of causing it to be turned and shaken, was first made known in the beginning of the sixteenth century. — Although it certainly does appear from *Pliny*, that the inhabitants of *ancient Rome* usually had two sorts of meal, one called *cribra excussoria*, and the other *pollinaria* ; yet we have seen that it is not till of comparatively modern date that even the division from the bran has taken place in Europe.

The best bolting-cloths are universally confessed to be manufactured in England ; they are made from wool of the longest and best kind peculiarly prepared. Being first well washed, and spun to a fine and equal thread, which, before it be scoured, must be scalded in hot water to prevent its shrinking. The web must be then stiffened ; it is in this we possess an advantage which others cannot attain. Our bolting-cloth is stiffer, as well as much smoother, than any

foreign manufacture. So jealous are our German neighbours of this, that they have at Ostra, Hartau, Strietzel, Gera, Potsdam, and Berlin, with other places, established manufactories at a great expense, and under very peculiar regulations, for its fabrication. After all, they are compelled to confess, that theirs will not wear above three weeks in a flour manufactory, whereas ours will continue well three months in equal exposure to friction and ordinary wear.

For some years past the French have been much extolled for a mode of grinding, called *mouture économique*, that were we not aware such had been anciently practised in ancient Rome, it might be conceived to form an important epoch in the miller's art. This process, however, is not new; it consists in first grinding the wheat not so fine as might be required for ordinary purposes; afterwards putting the meal several times through the mill, and sifting it with various sieves. It should seem, this method was practised in ancient Rome; for *Pliny*, who took care to inform himself of most things, tells us, that in his time they had, at least, five different kinds of flour, which he thus enumerates, *similago*, *simila*, *flos*, *pollen*, *cibarium*, &c. words by no means synonymous, but each specifically importing a different species or kind of farinaceous substance, yet all procured from the same corn; but only distinctions arising from the different mode of its preparation, judged from circumstances to have been similar to that which the French mealmen have recently and so successfully employed. It appears, that the ancient Romans had advanced very far in this art, as well as in that of baking, &c. from what may be collected from its economical polity preserved by *Pliny* and others. Whence it may be fairly inferred, they knew how to prepare from corn more kinds of meal, and from meal more kinds of bread, than the moderns even now are acquainted with.

Pliny reckons that bread should be one-third heavier than the meal used for baking it; this proportion, it appears, was known in Germany upwards of one hundred years ago; and discovered from experiments on bread made at different times; German bakers, although they may have been occasionally uncertain, have always undoubtedly given more bread than meal.¹⁵ It appears, that in latter periods, the art of grinding, as well as baking, has declined very much in

¹⁵ Farther information on this subject is collected in *Krünitz Encyclopédie*, vol. iii. p. 384. According to experiments mentioned by *Köhler* in the appendix to his *Rechenmeister*, 100 lbs. of meal in Germany will produce 156 lbs. of dough, and 153 lbs. $11\frac{1}{4}$ ozs. of good bread.

Italy; and their bread, although produced from the finest grain in the world, is altogether bad when manufactured by Italians. On this account, it seems, bakers from Germany are generally employed in public baking-houses, as well at Rome as in Venice.¹⁶ Bakers of that people are generally settled at those places; where they have been in the habit of manufacturing that article for the principal persons for upwards of 300 years.

It should appear, that the *mouture économique* of the French, has been known to the Germans for upwards of 200 years, as appears from *Beckmann's History*. Many were the attempts, and repeatedly enforced, to deter the experiments made, from time to time, by the French experimentalists to perfect this article previous to its being accomplished. In this the French suffered themselves to be taught by prejudice and directed by ignorance. Numerous and judicious were the experiments which the scientific and philosophic of that people made to produce the most in quantity and best in quality from a definite portion of grain, at which the ignorant of their species suffered their prejudice to revolt, and the powerful readily came into the mode of thinking of the vulgar, to whom they lent their aid, to effect what heaven in revelation had commanded, *i. e.* “ Give not that which is holy unto dogs,”¹⁷ &c.

It will appear from the succeeding statement, that in using the language which has just appeared, circumstances sanctioned us. The clergy of the chapel royal, and parish church at Versailles, sent their wheat, in the beginning of the last century, to be ground at an adjacent mill: according to custom it was put through the mill only once, and the bran, which yet contained much flour, was sold for fattening of cattle. This miller having, however, in process of time learnt the process of the *mouture économique*, purchased the bran from these ecclesiastics, and found that it yielded him as good flour as they had procured from the whole wheat. The miller, at length, is presumed, in a qualm of conscience, to have regretted cheating those holy men; he accordingly discovered to them the secret, and gave them afterwards *fourteen* bushels of flour from their wheat, instead of *eight*, which he had alone furnished them before. This voluntary

¹⁶ *Vide* the treatise of *Rosa*, professor of medicine at Pavia, on the making of bread in Lombardy, in *Atti dell' Academia delle Scienze di Siena*, tom. iv. p. 321. Also *L'Amico de Poveri, che insegnia il vero modo di fare il Pan venale.* In Firenze, 1773, 8vo.

¹⁷ Matt. vii. 6.

discovery of the miller was made in 1760; it may be probable the same discovery was made at the same time by others.

A baker, named Malisset, proposed to the *lieutenant-général de police* to teach a method by which people could grind their corn with more advantage; and experiments were accordingly made, succeeded, and were published. A mealman of Senlis, named Buquet, having the inspection of the mill belonging to the large hospital at Paris, made the same proposal; the result of his experiments, conducted under the direction of magistrates, was printed. The investigation of this art was now taken up by men of learning and science, who gave it a suitable denomination; explained it, made experiments and calculations upon it, and, at the same time, recommended it so much, that the *mouture économique* engaged the general attention of all magistrates throughout France.¹⁸ Its government sent Buquet to *Lyon* in 1764, to *Bourdeaux* in 1766, to *Dijon* in 1767, and to *Mondidier* in 1768: the benefit which France derives at present from that trouble, shows that it was not taken in vain. Previous to that period, a Paris *setier* yielded from 80 to 90 lbs. of meal, and from 150 to 160 lbs. of bran; but the same quantity now yields 185 lbs. and, according to the latest improvements, 195 lbs. of meal. In the time of St. Louis, from four to five *setiers* were reckoned necessary for the annual maintenance of a man; these were even scarcely sufficient; so many were allowed to the patients of the hospital *aux Quinze-Vingts*; and such were the calculations made by *Budée* in the sixteenth century.¹⁹ When the miller's art was every where improved, the four *setiers* were reduced to three and a half, and from the latest improvements they do not exceed two.²⁰

From mills which only force the farinaceous parts from the husk, thereby rounding the grain, the common denomination of *barley-mills* comes; from such mills being used

¹⁸ *Histoire de la Vie privée des François*, par M. le Grand d'Aussy, Paris, 1782, 3 vol. 8vo. i. p. 50; and Professor Beckmann's History of Inventions, &c. vol. i. p. 265, *ut supra*.

¹⁹ *Budæus de asse*. Basiliæ, 1556, fol. p. 214.

²⁰ The principal writers on the *mouture économique* are the following: *Mémoire sur les Avantages de la Mouture économique*, par B. Dijon, 1769, 8vo. *Manuel de Mennier, et Charpentier de Moulins; ou Traité de la Mouture économique*, redigé sur les Mémoires du Sr Cesar Puquet; par M. Beguillet. Paris, 1775, 8vo. *Traité de la Connoissance générale des Grains, et de la Mouture par Economic*. Par M. Beguillet, Paris, 1775, 2 vol. 8vo. *Pan économique*, par M. de Butré. Carlsruhe, 1777, 8vo. *Le parfait Boulanger*, par M. Parmentier. Paris, 1778, 8vo. See also Professor Beckmann's Biblioth. x. 74, 79; and Hist. of Inventions, i. 265, *ut supra*.

in the manufacture of *pearl-barley*. In their construction these mills differ but little from wheat-mills, and the machinery for the former is generally added to the latter. The grand specific distinction is, that the mill-stone is rough-hewn round its circumference, and in the stead of a lower stone there is generally a wooden case; the middle lined with a plate of iron, pierced like a grater with holes, the sharp edges of which turn upwards. The barley is thrown upon the stone, which, as it turns round, frees it from the husk, and rounds it; after which it is put into sieves and sifted. Pearl-barley manufactured at Ulm, is struck by a common mill, the stones being separated to a sufficient distance not to bruise the pulp of the grain. This invention is of German origin.

So long as the policy of governments was blind to the true interests of men, and so long as the griping avarice of a few was permitted to lay the free-born of their species under the most severe of contributions,—so long were persons permitted to build mills only, who had obtained a regal licence for that purpose. But, thank heaven! that ray of light it has lent generally to man, has in some sort illumined even the minds of ministers and their tyrannical masters, to curtail that universal spirit which had cast the fetters of vassalage given by feudal tyranny to its upstart dependants; men were left, at length, to improve their property according to their judgment. Since which period more mills have been erected for the convenience of the species. This privilege, it appears, was not prohibited by the Roman laws; those irradiations of superior intellect well appreciated human rights. It was not till the darkness of the middle ages had obscured the mental hemisphere, that any person was presumed to possess a superiority over others, and to abridge the small portion of general happiness that the favoured of fortune might add to his satiety. During those days of universal darkness, numberless were the evils which men suffered, and among them the present object of our consideration was not the least; frequently having to travel for miles to a mill to procure the necessary manufacture of so essential an article to human life as **BREAD**.

Let us not, however, be decoyed by the resentment produced by the spirit of human oppression, beyond the bounds prescribed by reason, to inveigh against such ordinances when public and general utility ever was consulted; and certain public streams were by wise laws to be kept free from individual encroachments with impunity. It is not against the

the dictates of sober reason we declare hostility; but the abuse of power.

A time there was when human baseness in princes and potentates, their vassals doubtless aping the manners of their masters, claimed as their right not only the common element of water, but also that of air! A curious incident related by *Jargow*,²¹ and detailed by *M. Beckmann*, as follows, establishes the insolence of upstart men:—“ In the end of the fourteenth century, the monks of the celebrated but long since destroyed monastery of Augustines, at Windsheim, in the province of Overyssel, were desirous of erecting a wind-mill not far from Zwoll; but a neighbouring lord endeavoured to prevent them, declaring that the wind in that district belonged to him. The monks, unwilling to give up their point, had recourse to the bishop of Utrecht, under whose jurisdiction the province had continued since the tenth century. The bishop, highly incensed against the pretender who wished to usurp his authority, affirmed, that the wind of the whole province belonged to him only; and in 1391, gave the convent express permission to build a wind-mill wherever they thought proper.”²²

Without the convenience of human ingenuity, heaven had sent the blessing of life in vain: we have, under this impression, bestowed so much time, and encroached upon that room we can ill spare, to this article, from a conviction of its vital importance to the necessities of human existence.

CLEPSYDRÆ, &c.

CLEPSYDRÆ, or *Water-Clocks*.—*Vitruvius*, the Roman architect and mechanist, ascribes the invention of the water-clock to *Ctesibus* of *Alexandria*, who flourished in the reign of *Ptolemy Evergetes*, about 245 years before the Christian æra. The same author says the machine was first introduced at Rome by *P. Cornelius Scipio Nasica*, U. C. 594; or 257 before the Christian æra. There appears reason to believe, it was *first* introduced at Rome into courts of justice from Greece, as it had been originally in Greece used for

²¹ *Jargow*, *Einleitung in die Lehre von den regalien*. Rostock, 1757, 4to. p. 494.

²² As our monastery had not a mill to grind corn, they resolved to build a new one. When the lord of Woerst heard this, he did every thing in his power to prevent it, saying, that the wind in Zealand belonged to him, and that no one ought to build a mill there without his consent.

this purpose; the Roman orators being guided in the time they occupied the court, by this instrument, as we may learn from this expression of *Cicero*, “*Latrare ad clepsydram*.”

Cicero also informs us, that it was first introduced into courts of justice in the third consulate of Pompey, in the following expression:—“*Primus tertio consulatu Cn. Pom- peius adstrinxit imposuitque velut frēnos eloquentiæ.*” —*Auctor Dialog. de Caus. cor. Eloq. 38.*

Thus, by this road we discover the inventions of Egypt, Chaldea, and other oriental countries, constantly travelled to Rome and the west. Long since the respective periods previously mentioned, has the honour of this invention been claimed by *Burgundians*, *Bolognese*, other *Italians*; sometimes by *Frenchmen*, but chiefly by *Germans*.

Their claim for invention seems to be questionable in numerous instances, whatever it may be for *improvement*; they certainly cannot, consistently with the rule previously given, be considered as the *first inventors*; although there is nothing to be alleged against these respective people being the *discoverers* of designs which had a previous existence.

With equal or much more propriety might the *Arabians* in point of time, (could that be of consequence,) be considered as inventors of this machine; and they are well known to possess the least claim to original invention of any people. They, however, have a merit, notwithstanding; but it is of a negative species, for those arts, sciences, &c. which (by chance) were saved from the destruction of their bigoted ignorance, and which, when the fortune of war had thrown into their hands those pure designs of intellectual Greece, mere accident had wrested from their zealous fury. These they transmitted to a more ingenious people as pure as they received them; but upon precisely as good grounds as the before-named Europeans claimed this *original invention*, might the *Arabians* have assumed that honour. For we read that **HAROUN AL RASCHID**, caliph at Bagdad, then the chief seat of Saracen empire, sent as a present to **CHARLEMAGNE**, a clock of curious workmanship, which was put in motion by a *clepsydra*; which instrument is said, by *Dr. Adams*, our author, “To have “ been used by the ancients to measure time, by water “ running out of a vessel.”

It consists of a cylinder divided into several small cells, and suspended by a thread fixed to its axis in a frame, on which the hour distances, found by trial, are marked out: as the water flows from one cell into another, it changes

very slowly the centre of gravity of the cylinder, and puts it in motion.

The form of this instrument is thus described by Professor *Beckmann* :—“ The most common kinds of these “ water-clocks, all, however, correspond in this, that the water “ issued drop by drop through a hole of the vessel, and fell “ into another, in which a light body that floated, marked “ the height of the water as it rose, and by these means “ the time that had elapsed.”¹

The most improved form the same instrument hath acquired is thus described, by the same author, from one in his own possession.

“ Among the newest improvements to this machine may “ be reckoned an alarum, which consists of a bell and small “ wheels, like those of a clock that strikes the hours, “ screwed to the top of the frame in which the cylinder is “ suspended. The axis of the cylinder, at the hour when “ one is desirous of being wakened, pushes down a small “ crank, which, by letting fall a weight, puts the alarum in “ motion. A dial-plate with a handle is also placed, some- “ times, over the frame.”

Father *Kircher*, we understand, described several kinds of water-clocks in his *Ars umbræ et lucis*, first published in 1643.

To describe the progress of time, *Vitrum-horæ* had been also invented, or conical hour-glasses, in which were placed a portion of sand, which glasses were joined together at the apex of the cone, with a small aperture of communication between the two : from the glass in which the sand was deposited, it dropped grain by grain into the glass below; standing upon its flat basis, which was appointed to receive it; these machines are called *hour-glasses*, and well known. We have no account of the origin of this instrument ; but, from its simplicity, it admits of no improvement. It is also believed this had its origin in a convent.

¹ In respect to the invention of *clepsydrae*, we should think the original inventor took his first idea from the use of an instrument, common in Egypt, which that people called a *CANOB*, or *Nilometer*, being a large stone vessel of the shape of a *sarcophagus*, into which water was daily poured, by proper officers, during the increase of the Nile, to show the people whether they had a prospect of plenty, or were to expect a scarcity in the ensuing year. As the fall of the water, after it had risen to a due height, was of equal importance to them ; so the water was suffered to run out proportionably to its decrease in the river, being ascertained by just and equal marks they generally well understood. — *Vide Montfaucon's Antiq. Explicat. et L'Abbé Pluche, Hist du Ciel.*

CLOCKS.

The invention of *Clocks*, such as are now in use, is ascribed to *Pacificus*, archdeacon of *Verona*, who died in 846. Clocks were first known in England in 1368. They were ultimately improved by the application of pendulums, in 1657, by *Huygens*, a Dutch astronomer and mathematician. Although *Beckmann* differs in some slight degree from the previous relation concerning clocks, yet he says, vol. i. p. 433. “ It is sufficiently apparent that clocks, moved “ by wheels and weights, began certainly to be used in the “ monasteries of Europe, about the 11th century.” He does not think, however, that Europe has a claim to the honour of the invention, but that it is rather to be ascribed to the Saracens ; this conjecture he confesses is chiefly supported by what *Trithemius* tells us of one which was sent by the Sultan of Egypt to Frederick II. in 1232. He thinks the writers of that century speak of clocks as though they had been then well known : he adds, that in the fourteenth century, mention is made of the machine of *Richard de Wallingford*, which has been hitherto considered as the oldest clock known. This machine is thus described by *Leland*, the historian :—“ *Electus in monasterii præsidem—cum—*
 “ *jam per amplas licebat fortunas, voluit illustri aliquo*
 “ *opere non modo ingenii, verum etiam eruditionis ac artis*
 “ *excellentis miraculum ostendere. Ergo talem HOROLOGII*
 “ *fabricam magno labore, majore sumptu, arte vero maxima*
 “ *compegit, qualēm non habet tota, mea opinione, Europa*
 “ *secundam; sive quis cursum solis ac lunæ, seu fixa sidera*
 “ *notet, sive iterum maris incrementa et decrementa, seu*
 “ *lineas una cum figuris ac demonstrationibus ad infinitum*
 “ *pene variis consideret: cumque opus æternitate dignis-*
 “ *simum ad umbilicum perduxisset, canones, ut erat in ma-*
 “ *thesi omnium sui temporis facile primus, edito in hoc libro*
 “ *scripsit, ne tam insignis machina errore monachorum vi-*
 “ *lesceret, aut incognito structuræ ordine sileret.”*

The fabricator of this machine called it **ALBION**.

It appears that clocks had been hitherto shut up in monasteries and other religious houses, and that it was not till after this time they were employed for more general purposes, as the convenience of cities. The first instance on record that has been yet noticed occurs where *Hubert*, prince of *Carrara*, caused the first clock, that was ever publicly exposed, to be erected at *Padua*, as *Peter Paul Vergerius*

informs us. “ *Horologium quo per diem et noctem quatuor et viginti horarum spatia sponte sua designarentur, in summa turri constituendum curavit.*” It was erected by *James Dondi*, whose family afterwards, in consequence, had the pronomen of *Horologio*, assigned them: in remembrance of this circumstance it is also mentioned on the tomb-stone of the artist:

“ *Quin procul excelsæ monitus de vertice turris
Tempus, et instabiles numero quod colligis horas,
Inventum cognosce meum, gratissime lector.*”

The family of this artist now followed the profession of manufacturing clocks; for his son, *John Dondi*, constructed one upon improved principles, thus described:— “ *In quo erat firmamentum, et omnium planetarum sphæræ, ut sic siderum omnium motus, veluti in cœlo, comprehendantur; festa edicta in dies monstrat, plurimaque alia oculis stupenda; tantaque fuit ejus horologii admiranda congeries, ut usque modo post ejus relictam lucem corrigere, et pondera convenientia assignare sciverit astrologus nemo.*”

From the *Chronica miscella Bononiensis* may be learnt, that the first clock at *Bologna* was put up in the year 1356: “ *A di octo di Aprile fu tolta via la campana grossa della torre, ch'era nel palazzo di Messer Giovanni signor di Bologna, &c.*”

Some time after the year 1364, *Charles V.* surnamed the Wise, King of France, caused a large clock to be placed in the tower of his palace, by *Henry de Wyck*, whom he had invited from Germany, because there was then at *Paris*, no artist of that kind, and to whom he assigned a salary of six sols per diem, with free lodging in the Tower.

Towards the end of that century, probably about 1370, *Strasburgh* had a clock; an account of which was rendered by *Conrad Dasypodius*, in *Iac. von Königshovens Elsass und Strasb. Chronik.* p. 574.

About the same period, *Courtray* was celebrated for its clock, which the Duke of *Burgundy* carried away, anno 1382. This circumstance is related by *Froissart*, an annalist and contemporary writer.

Lehmann says a public clock was erected at *Spire*, anno 1395, in the *Altburg* gate, the works of which clock cost 51 florins.

The greater part of the principal cities of Europe, however, at this period, had clocks without striking. Clocks could not be procured, but at a very great expense: of this an instance occurred in the city of *Auxerre*, in the year

1483, when the magistrates being desirous of a clock, but discovering that it would cost more money than they thought themselves justified in expending on their own authority, applied to the Emperor Charles VIII. for leave to employ a portion of the public funds for that purpose.

In 1462, a public clock was put up in the church of the Virgin Mary at *Nuremberg*.

At *Venice* a public clock was put up in 1497. In the same century, *i. e.* 1484, an excellent clock was put up for *Cosmo de Medici*, by *Lorenzo*, a *Florentine*, which was described by *Politian*, in a letter to his friend *Francis Casa*.

Thus we have mentioned their first origin in Africa, Asia, and Europe, until they came to ornament the residences of the religious, the palaces of kings, and the chief European cities. It now remains for us to take some notice of their existence in our own native land for public use. From the documents we possess, it appears that so great was their expense considered in those early times of their existence, that it was only the powerful and the rich who could procure them. Consistent with our design, we discover that the first clock of a public nature and for lay purposes, in *England*, was one erected on the north side of *Old Palace Yard, Westminster*, on which was this inscription, *Discite justitiam moniti*; which inscription is said to have been preserved many years after the clock-house had been decayed.

It is asserted that this clock was placed in that situation, for the purpose of being heard by the courts of law; and the occasion which produced its existence is thus recorded. It was the produce of a fine levied upon *Radulphus de Hengham*, lord chief justice of the court of King's Bench, in the reign of Edward the First, an. 1288,² of whom it appears, by a book called the *Year Book*,³ that this magistrate had been fined 800 marks for making an alteration in a record, whereby a poor defendant had been fined 13*s. 4d.* and he, the chief justice, made it appear to be 6*s. 8d.* instead of that the larger sum.

Notoriety, however, was attached to this transaction from the following circumstances: First, it appears to have been one of three questions put by *Richard III.* to his judges, with whom he was closeted in the *Inner Star Chamber*, to

² See *Selden*, in his preface to *Hengham*.

³ *Blackstone* hath observed in the third volume of his *Commentaries*, that this punishment of *Hengham* is first noticed in the *Year Book*, during the reign of *Richard III.* It appears the case occurred in Mich. term, 2 *Richard III.*

take their opinions on three points of law. The second question was, "Whether a justice of the peace, who had enrolled " an indictment which had been negatived by the grand " jury, among the *true bills*, might be punished for the " abuse of his office?" On this question a diversity of opinion arose among the judges, some of whom supposed a magistrate could not be prosecuted for what he might have done; whilst others contended that he might, and cited the case of Hengham: so far was the answer of the judges strictly proper and historically true. The *second* circumstance to which we have alluded, and which is most material to our present question, is the application of the fine. It appears that it was expended in the construction of a clock, which was erected on the north side of Old Palace Yard; so that the judges, barristers, and students, could not enter or leave the Hall, without having an opportunity of being reminded of the punishment of the merciful Hengham, for presuming to violate the impartial duty of his high office; nor could they even hear it strike, whilst upon the throne of justice, without having his case repeated in their ears; thereby acting as a constant remembrancer, intimating they were to administer justice more than mercy.

Sir Edward Coke observes, that the 800 marks were actually entered upon the Roll, so that it is extremely probable he had himself seen the record. *Institutes*, iv. p. 255.

This clock was considered so important during the reign of Henry VI. that we find that king gave the charge of keeping it, with its appurtenances, to William Warby, dean of St. Stephen's, with the pay of sixpence per diem, to be received at the Exchequer. See *Stowe's Westminster*, vol. ii. p. 55.

The clock of St. Mary's, Oxford, was also furnished in 1523, out of fines imposed upon the students of that university.

With respect to the clock from Hengham's fine, we must also observe, that its motto appears to relate to that circumstance; but though it may be said that it might relate to a dial as well as to a clock, a material observation to our present inquiry; yet with respect to its present absence, it should be noticed, that it is probable that clock was a very indifferent one, but from its antiquity and the tradition attending it, was permitted to remain till the time of Elizabeth; then being quite decayed, a dial might have been substituted upon the same clock-house, bearing the very singular motto which, however originally applied,

clearly alludes to such a circumstance as reported of Hengham. This dial, according to *Strype's* continuation of *Stowe*, is placed on the very site where the original clock-house stood.⁴

But it is said by *Derham*, in his *Artificial Clockmaker*, that the oldest clock in this kingdom is in Hampton Court Palace, marked with the letters *N. O.* presumed to have been initials of the maker's name, of the date of 1540; but that author is evidently mistaken, in alleging that to be the oldest, because the Oxford clock was fabricated 17 years anterior to that period. With respect to the letters *N. O.* their meaning may not be of importance. From Shakspeare's *Othello* it is proved the ancient name of this instrument was *Horologe*; which various passages in our poets and old authors establish.

“ He'll watch the *horologe* a double set,
“ If drink rock not his cradle.”

Chaucer, also, says of a cock,

“ Full sikerer was his crowing in his loge,
“ As is a clock, or any abbey *orlogie*.”

Which tends to show, that in his time clocks had been confined to religious houses.

So Lydgate's prologue to the story of Thebes:

“ I will myself be your *orologere*
“ To-morrow early.”

WATCHES.

About 1490, mention is made of *watches*, which first occurs in the Italian poems of *Gaspar Visconti*, particularly a sonnet with the following title;—“ *Si fanno certi orologii piccioli e portativi, che non poco di artificio sempre lavorano, mostrando le ore, e molti corsi de pianeti, e le feste, sonando quando il tempo lo ricerca. Questo sonetto è facto in persona de uno inamorato, che, guardando uno delli predicti orologii, compara se stesso a quello, &c.*”

Hò certa occulta forza in la secreta
Parte del cor, qual sempre si lavora
De sera a sera, e d'una a l'altra aurora,
Che non spero la mente aver mai quieta.
Legger ben mi potria ogni discreta
Vista nel fronte, ove amor colora

⁴ This clock-house continued in a ruined state till 1715. — *Antiquarian Repository*, p. 280.

D'affanno e di dolore il punto e l'ora,
 E la cagion, che riposar mi vieta.
 L'umil squilletta sona il pio lamento,
 Che spesso mando al cielo, e la fortuna,
 Per disfogar cridando il fier tormento.
 De le feste annual non ne mostro una,
 Ma pianeti iracondi, e di spavento,
 Eclipsati col sole, e con la luna.

Antonii Saxii Hist. literario-typographica Mediolan. prefixed to
Philippi Argelati Biblioth. Scrip. Mediolanens. i. p. 360.

It ought to be observed, that *Dominico Maria Manni*, in his book *De Florentinis Inventis*, ch. 29, calls the artist *Lorenzo a Vulparia*, saying he was a native of Florence.

One might naturally be inclined to believe, that the honour of original invention is duly demanded by the whole Germanic people, from the claim of the invention of watches being aspired to by the *Nurembergians*; as *Doppelmayr* alleges they were first invented by a person residing in that city, in the 16th century, of the name of *Peter Hele*; and perhaps he has no better foundation for his conjecture, than that the first watches, being shaped somewhat like eggs, were called *Nuremberg eggs*.

Shakspeare, in *Twelfth Night*, speaking of a watch, has the following expression, used by *Malvolio*: “ I frown “ the while; and, perchance, wind up my *watch*, or play “ with some rich jewel.” Also, the *Priest*, in answer to *Olivia*,

“ Since when, my *watch* hath told me, toward my grave
 “ I have travell'd but two hours.”

The following observations appear to sanction our opinion of the early existence of those machines in this country. Dr. *Derham*, in his *Artificial Clockmaker*, published in 1714, hath mentioned a watch of Henry VIII. which at the period he wrote was in order. Indeed, Dr. *Demainbray* had said that he had heard Sir Isaac Newton and *Demoivre* both speak of that watch.⁵

An anecdote is related of the Emperor Charles V. contemporary with Henry VIII. which it appears hath reference to the policy of Europe at that day. It is said the Emperor, after dinner, used to sit with several of them on the table, with his bottle in the centre. After that prince's retirement to the abbey of St. Just, he still continued to amuse himself with keeping them in order. From his in-

⁵ Mr. Walpole possessed a clock, which, from an inscription, appeared to have been a present from Henry VIII. to Anne Boleyn. *Poynet*, bishop of Winchester, gave an astronomical clock to the same monarch.

ability to effect this correctly, it is reported he drew the rational reflection, *that it was utterly impossible to effect what he had attempted, the regulation of the policy of Europe.*

It appears that many watches of that day struck the hour. The *Memoirs of Literature* report that such watches having been stolen from Charles V. and Louis XI. whilst they were in a crowd, the thieves were detected from their striking.

It also appears from the evidence of certain watches of ancient construction formerly held by Sir *Ashton Lever* and also by Mr. *Ingham Forster*, that *catgut* usually supplied the place of a chain in ancient watches; also that they were formerly of a smaller size than now made, and generally of an oval form.

Imperfections of this nature, and probably other causes, might have rendered their truth uncertain, and this most probably precluded their general use, until the latter end of the reign of Elizabeth. The instances we have shown will prove they were generally known, and perhaps used, at the time of *Shakspeare* writing his *Twelfth Night*. And in the first edition of *Harrington's Orlando Furioso*, published in 1591, the cut preceding the title page represents the author with what appears to be a watch, although the engraving is extremely indistinct; moreover, the inscription to which cut or engraving of *Il Tempo passo*, clearly indicates the same thing.

Charles I. in 1631, incorporated the Clockmakers' company, and by charter, which prohibits clocks, watches, and alarums, from being imported; which circumstance proves, that the English, at this period, had no need of the aid of foreign ingenuity in this branch of mechanism.

We are told that Guy Fawkes and Percy were detected in the third year of James I. with a watch about them, which they had purchased, "to try conclusions for the long and short "burning of the touchwood," (in the words of the time,) which was prepared to give fire to the train of gunpowder.

The last and most material improvements introduced in this branch of mechanical knowledge took place in the addition of pendulums, by *Huygens*, as applied to clocks; for which conception he was indebted to *GALILEO*, which that philosopher adopted for measuring time, he having taken the idea from observing the vibrations of a lamp in a church. This reign also boasts of the production of repeating watches in England; first fabricated under the direction of the celebrated Dr. *Hook*, and manufactured by *Tompion*.

A curious anecdote is related of the attention of James II. to watches, recorded by Dr. *Derham*: one *Barlow* had procured a patent, in conjunction with the lord chief justice *Allebone*, for repeaters; but one *Quare* making one at the same time upon ideas he had entertained before the patent was granted to *Barlow*, the king tried both in person, and gave the preference to *Quare's*, and caused it to be notified in the *Gazette*.

In the next reign the reputation of British manufacturers in this article had increased so much, that the parliament passed an act, enacting that British-made watches, &c. should be marked with the maker's name, in order to preserve the reputation of this branch of British manufacture from coming to discredit in foreign markets.

Thus we have given a general history of this branch of mechanics, for a period of 964 years, from the first invention of clocks by *Pacificus* in 846, to the commencement of the last century. Having noticed the various improvements in the order they occurred, among which the most striking feature appears to be the addition of the pendulum to clocks, as serving to regulate the motion of the machine; from its given length, certain weight and uniform vibration, must be conceived to have been a happy thought in *Galileo*, for the admeasurement of time, whilst the conception of its application to this branch of mechanics was no less fortunate in *Huygens*. Indeed, should we go farther back in retrospect, it will be discovered that the *clepsydra* first invented a measure of time: we then discover that we have looked into its abyss as remote as 2064 years.

Our thanks are due to many indefatigable antiquaries for the assistance their labours have afforded us in this research. Among others, the learned and ingenious *Beckmann*, Dr. *Derham*, and the honourable *Daines Barrington*, have our respectful gratitude. These feelings are due to those gentlemen just named: but lest it should be said we have depended too much upon suggestions with which their works have furnished us, to the neglect of those usual industrious principles which generally direct us; we observe, that although we are anxious a more remote research might have been made with respect to machines for ascertaining the duration of time, and distinguishing its various periods, such researches would have employed much room, and have been attended with little satisfactory certainty; whereas what we have advanced may be depended upon. We might have searched the records of Chaldaea, the Israelitish history, and other Asiatic records; when we know we should

have, among other circumstances, referred our readers to the eleventh verse of the twentieth chapter of the second Book of Kings, and to other prominent notices of the mode of division of time by the posterity of Abraham and other Asiatic people. Because, to use the words of the very learned author of *Pseudodoxia Epidemica*, with respect to *sun-dials* and *hour-glasses*, “ both which instruments are of “ the most remote antiquity.”

NATURAL PHILOSOPHY.

Of all historical speculations, which the mind of a finite and imperfect creature can attempt to comprehend, or essay to describe, surely none can be more extensive in nature, important in consequences, or so transcendantly majestic in effects, as is the History of Natural Philosophy. It embraceth the most extensive periphery of human knowledge, of practical and theoretic speculation ; nay, it even aspires beyond those confined bounds of usual speculative inquiry,—ascending beyond those limits of positive certainty which mankind are usually in the habit of contemplating as the effects of natural causes. It disrobes mysticism of its veil, follows nature through all her intricate mazes, explores the connexion between causes and their effects ; reconciles to reason and probable truth those effects which lie beyond the ken of common observation, by analogy with things already known ; tending to clear and elevate the human understanding, at the time it essays to correct our false impressions, to amend and humanize the heart. These, in our conception, are the views of the history of nature ;—should they be correct, we trust their importance is sufficiently impressed upon our mind to induce the utmost exertion of our powers correctly to conceive, and faithfully to render our conceptions to the world in unison with those of the philosophic and wise, from the most remote ages of antiquity.

Its History.—We have already been favoured with a transient glance of the chief characters, who have been eminent in the history of natural philosophy, in the brief view we have already taken of *Astronomy* ;—but as that wonderful prodigy of human intellect, successful research, and unremitting industry, ARISTOTLE, is there only casually mentioned ; and since his acute investigation could not be satisfied with those systems he found already then existing,—he investigated things personally,—adopting only such truths as he thought he had discovered, and which from the trouble he took to ascertain, he thought incontrovertible.

He thus formed to himself a new system, which in that dark age had many converts, and in the comparatively middle age of the world; or at that period when human intellect in Europe was just emerging from that chaotic darkness, which the barbarity of Vandalism had spread over the European world, subsequent to the demolition of the power of imperial Rome, and the destruction of its classic elegance,—the cloisters of the superstitious, the cells of the devotees, and the schools of instruction, suffered themselves to be entirely guided by the dogmas of the peripatetic system of philosophy, in matters of moral thinking, and in affairs of philosophical inquiry.¹

For the reasons which follow, we deem it important to give a more complete and specific detail of his system; first, because we are engaged upon this definite subject; next, because his system has had so general an ascendancy; and, in the third and last place, because its detail will fill up the *hiatus* which occurs between the notions of the primitive philosophers, and those ideas in more modern and improved systems now existing;—an additional reason presents itself, because his system in fact actually supplied the very chasm, which occurred in the philosophical faith of our species.

The materials we use for the brief analysis we propose to give, are extracted from the *Cyclopædia* of Dr. Rees, *vide* article ARISTOTLE.

He commenced by assuming a postulate that *matter* was eternal, original, and possessed inherent qualities existing in itself; that it also possessed two modes of existence,—one of which he called *form*, and the other *privation*;—being contrary to each other in their effects, whilst form was the common subject of both. He also thought matter was substantial, (but in its original state, we suppose,) was without either quantity or quality, form or figure; or, in fact, without any of the qualities of body, except its substantial nature. He conceived this idea to have been his own, but it should seem, it claimed an anterior, if not superior original, for it was belonging to the principles adopted by Pythagoras.¹ Form Aristotle maintained to be the peculiar nature or *essence* of things, and privation its associate as an accidental consequence.

¹ It is a known fact that the ancient schoolmen bowed so implicitly to the authority of Aristotle, that notwithstanding the superior devotion they may have been presumed to offer to the religion they professed, some of them went so far as to declare, “That had not Aristotle existed, Revelation and the Gospel of ‘Peace would have been but of little service to them.” Preface to the *Annals of Literature* for 1777.

In order to unite matter and form, he conceived a crude and very imperfect idea of NATURE. Causes he distinguished into three parts : 1st, *material*, of which things are made ; 2d, *formal*, by which every thing is what it is ; and, 3d, *final*, or the ultimate end for which it is produced.

Substances Aristotle divided into *elemental*, as the heavens, which move round the earth in a circular direction, peculiar to celestial bodies ;—and *perishable*, as animated nature, and other terrestrial substances. The heavenly sphere has neither levity or gravity, is liable to no change, is eternal ; moving from west to east ; the other spheres move in the contrary direction to this, to produce the diversity of seasons and the vicissitudes of other terrestrial things. This, the first sphere, or *primum mobile*, is also equable and uniform,—this and the first mover being eternal and immutable. The stars are of the same nature with that which supports them, but more dense ; they give light and heat to the atmospheric air, whence it is communicated to the earth by friction. They are moved in consequence of the motion of the sphere in which they are placed. The earth is spherical and immovably fixed, in the centre of the motion of the spheres. The first sphere revolves with the greatest velocity, in the direction already stated, and the other spheres move in a contrary direction. The velocity of the spheres of the seven planets, are inversely, as their distance from the first sphere. The world is infinite and eternal. There is only one world. Bodies are either simple elements, the produce of primary matter and form ; or else compounded terrestrial bodies, produced from the combination of elementary substance. The ELEMENTS are *four*, i. e. *fire*, *air*, *water*, and *earth*. The two principles of motion are gravity and levity :—by the former, bodies descend towards the centre of the world ; and by the latter, they ascend towards the heavens. The element of earth, has simple gravity ; that of air, simple levity :—water partakes of both. Compound bodies suffer a perpetual succession of dissolution and re-production ; which change is effected by the action of a circular motion of the heavens, by means of which the sun and stars, which are the immediate agents in production and dissolution, approach towards or recede from the earth. An action and a passion that are reciprocal, arise from the mutual contact of different bodies. In sensible bodies there are certain primary qualities, some active and others passive, which constitute their specific difference. Of this kind,—are heat and cold,—moisture and dryness,—hardness

and softness,—heaviness and lightness,—roughness and smoothness,—and the like.

From the union of the two first pair of these primary qualities, the elements are furnished: as, *fire*, from heat and dryness; *air*, from heat and moisture; *water*, from cold and moisture; and, *earth* from the union of cold and dryness. All the elements may be transmuted,—and all mixed bodies are formed by the combination of all of them. From the general principles of production and dissolution, and from the mutual action and passion of these simple qualities, Aristotle endeavours to explain the nature of mixed bodies, as well perfect as imperfect.

Critically viewing the general tendency of these opinions, however, we do not think that the Stagirite could support his claim to originality, in the manner set forth upon their introduction. Because we discover numerous of the chief distinguishing traits of those systems of other philosophers, independent of the Pythagorean, already noticed, as arising prominently in the very face of his ideas. Among these,—those of Democritus appear, in respect to the innate power of matter to produce;—those of Parmenides, with respect to the situation of the earth;—Anaximenes, with relation to the nature of the stars;—of Anaxagoras, as to the gravitating power which retained them in their orbits;—Xenophanes, as to the common nature of God and the world, &c. And in brief, of a great variety of others, which appear to have been borrowed from some system or other.

Aristotle, however, in common with all the ancients, and it is to be lamented, thought and acted upon false principles, from their not possessing that clear view of nature and its Great Original, which the moderns, under a clearer prospect of the power of Omnipotence, enjoy. They wanted to have recognised this first great and eternal principle;—to this deficiency, doubtless, are all the errors of their subsequent deductions to be ascribed.

But as conspicuous a mistake as any which presents itself, is found in his whimsical production of the elements:—comparing these principles with the opinions at present entertained, no circumstance could have been selected, which so powerfully invalidates the rationality of his doctrine.

An *element*, by the modern acceptation of that term, and in which sense it appears to be consonant to nature, implies “Some primary, self-existing, and original principle, whose “chief characteristic is simple *unity*; and to which feature

“ may be also added, independence of any other existence,
 “ except from the original will of the great Author of all
 “ existence;”—whereas he makes his elements to be con-
 sequential productions, proceeding from his primary existing
 principles.

With deference to the good opinions of our species, and a tender concern for their prejudice,—we now propose to submit our own conception of the number, nature, and order of the elements, which we propose *should* be considered as such. At the time we make such arrangement,—to convince the world that it is not from a desire for innovation,—we assign our reasons for such disagreement.

Accordingly, we contend, that the elements should be considered in number **SIX**;² and that they should be arranged in the following order. *Air, fire, light, water, earth, and spirit*, which we propose to be all distinct, separate, and independent of each other,—pure and *primæval*.

To establish our position, we also borrow an idea from the ancient schools, and go to that of the Abderite, *Democritus*, and we name him in preference to *Leucippus* and *Mochus*, because he appears to be the publisher of the ideas we embrace upon this particular occasion, and which he is said to have owed to them. We take as a postulate,—and propose to prove it beyond hypothesis,—that the original of all natural existing substances is in separate corpuscles or globular atoms. To convince ourselves of this truth, let us look to the formation of *air* and *water*: that both are fluids, and regulated by nearly similar laws, that of *statics*; that they are both visibly original and produced in globular transparent atoms, the following observations may establish: in moist and dense weather we may perceive air in the reflection of a sun-beam, when the light meets with any dense object, which evidently separates it from shade, when we can clearly see the particles, their form and transparency vibrating in the light of the beam. Also, the portion of air confined in sugar, upon that substance being put into any liquid, rises in globules to the surface. This, it is true, may be applicable to what is called fixed air. Moreover, such is the appearance of air produced in *pneumatics*, by the heat of the chemical furnace; as well *oxygen*, as *hydrogen* and *azotic*, in brief, every description of air. That water is also similarly

² This we can establish without making a voyage to *China* to look for them; as the Chinese consider *wood* and *iron* to be elemental, among a great variety of other substances. *Vide De Pauw's Dissertation sur l'Egyptien et Chinoise.*

formed, let us inquire:—does not the primitive form of the liquid element consist in dews?—which we see and know to be the produce of exhalation from the aquatic element, having ourselves traced, from the top of a mountain, the progress of a considerable river for upwards of forty miles in a clear day, under the influence of a meridian sun, and purely from the exhalation raised by that luminary. Also, see the subsequent remarks of Dr. Halley, under the article *Winds*. Besides it is a fact generally admitted.

With respect to *earth*, it is also sufficiently evident that when it is reduced to the most impalpable powder, that the particles assume that identical form, the globular, a microscope will aid our vision to discover. With reference to *light* also, it is acknowledged that light proceeds from a luminous body in direct lines, until it is refracted from its rectilineal course by any object whatever. Now, geometers admit that all lines are nothing but a repetition of particles, that these of air must be transparent the very nature of this element will establish.

As it concerns *fire*, that this is also atomic, the following observations may suffice for hypothesis:—fire is confessed to consist in the active operation of its particles, separating with violence all matters upon which combustion has operation. This may be in part proved, by witnessing the extra degree of dissolution, and observing how much its action is accelerated by the operation of air upon this element. For were not its particles homogeneously clothed, as is air this effect could not be produced; but particle acting upon particle, increasing the action of the ignitious element, accelerates combustion.

I.—To pursue the thread we left awhile, to settle principles of our philosophical faith, we now proceed and observe upon AIR. We have already noticed the opinion of that great original genius *Anaxagoras*, upon this element, in a preceding article, (*Astronomy*,) in which he is said to have held “air to be the original of all things.” This concise mode of expression may have allowed that inference a more extensive latitude than the author of the opinion intended should be applied, but such was the usual mode of expression of his day; viewed in its most extensive sense, the idea may, to those not nicely discriminative, and who have not taken the latter circumstance into consideration, be looked upon as chimerical. Yet search the opinion, try it by the test of philosophical rules, call in the aid of *pneumatics*, and it will be readily discovered, that if air is not the original of all things, the most convincing assu-

rance will follow to establish its general identity in all substances; yes, pneumatics will prove that no element whatever possesseth so universal an agency, so general an existence, as does air.

On considering the works of the great God of nature in the most transient manner, we shall instantly recognise its omnipresence, at the time we shall be satisfied with its tremendous omnipotence. To establish our primary position, let us ascend into the highest point of elemental atmospheric space, it is there we find it; let us traverse its great extent to a distance of fifty miles every way from the surface of the globe, we cannot escape its influence;—yes, let us ascend 100,000 millions of miles higher, traverse boundless space in every direction; like a comet, let us direct our course in any eccentric direction; approach the sun, then recede from the resplendent orb to the utmost extent of human limited conception;—in this extensive range, we have every where taken, we are in the very presence of the power whose empire is so very extensive,—in that of pure *ether*; which philosophy confesseth to be the basis of air, “*pure air is ether*,” the exhalations of the earth having obtained that name, from their obtruding themselves into the association³ of the aerial matter; this does not deprive air, properly so called, of the denomination of element, which it would do, were the philosophical *fact* to be as vulgar conception believes it.

Secondly.—Its dreadful agency is manifested in human concerns, by the power expressed on the ignition of gunpowder; which action instantaneously dissolves, or transmutes, the great variety of atomic corpuscular surfaces inclosing air, formed in its composition, imprisoning the aerial fluid: this is attended with an uncommon power of rarefaction, the aerial atomic globules being also swollen and extended to the utmost degree, with a percussion irresistible it impels every opposing force, with an uncommon tremendous report.

Let us turn our eyes, and for a moment contemplate the omnipotence of air in the hands of the eternal Architect of Nature, yes, of the universe: we shall then discover the most beneficial purposes, and likewise the most tremendous effects, to be the result of this element.

By its active influence under the operation of the solar

³ *Schede* settled the proportions of the component parts of air, to which *Lavoisier* and *Fourcroy* also assented, in the following proportions: 26 *vital*, 73 *azotic*, nitrous, or unwholesome, and 1 of fixed air, making 100.

heat, *gales* are produced, currents, eddies, &c. of wind are generated, which incessant motion in some part of the atmosphere or other, keeping that body pure, free from taint or infection: by the motion of the air numerous purposes of life are also answered; which the inventive genius of man has availed itself of, in the construction of windmills, the conveyance of the most ponderous weights upon the aquatic element from one part of the earth to the other. Winds, tempests, tornadoes, hurricanes, are only a portion of its dreadful effects.

In earthquakes observe them more manifest: see the sickening of nature, exemplified in the stillness of all elemental exteriors; see her trembling, anxiously awaiting the issue of some dread event:—the stillest water violently agitated, without any ostensible cause of motion. Observe the quiet of the feathered race, no song,—no flight,—they languidly droop the wing,—half close the conscious eye,—a film overshades that seat of sense,—collected wait their fate: nature at distance murmurs,—groans; she is heard sighing even to convulsion. The ocean suddenly rises into strong agitation, without the usual excitement;—towers nod,—battlements are shaken,—the earth itself, convulsed with tremulous emotion, now rises perpendicular,—now rolls on this side,—then on that;—villages are divided, the terrified inhabitants drop half way in the chasms, with horror in their looks,—despair in their eye;—some sink in one chasm to be thrown up in another,—some sink,—to rise no more! Thus cavities appear in every direction, whilst water, smoke, and fire are emitted from the terrestrial interior!—You dread to move,—are fearful to proceed;—every moment is pregnant with *your* fate,—and that of nature!⁴ Who can behold unappalled this tremendous scene, and not tremblingly confess the dread omnipotence of this awful element in the hands of the sublime Author of Nature?⁵

Lastly.—Let us view the incalculable power of this element in volcanoes: we shall then behold effects, for which there is literally no equivalent comparison in nature. When we see the enraged power hurling liquid sulphureous lava with intense flames to the height of 10,000 feet⁶ above

⁴ Plin. lib. ii. c. 79, 80, 81. Senec. Quæst. N. vi. 11, 12. Plin. ii. 79, 81, 94. Senec. Quæst. N. vi. 1. Marcellin. ii. 79, &c.

⁵ Neque aliud est in terra tremor, quam in nube tonitruum: nec hiatus aliud, cum fumen erumpit: incluso spiritu luctante, et ad libertatem exire niteute. Plin. ii. 79, 81.

⁶ This was the case with an eruption of *Vesuvius*, in 1779.

the mouth of the crater, accompanied with rocks, and the very heart of the mountain!—see the irresistible and overwhelming torrents of liquid lava and melted metals rolling down its sides, consuming all combustible substance which opposes its way,—sweeping every object it meets with into ignititious destruction; till presently its slackened course is gradually ingulphed in the ocean, with an horrific and tremendous noise, more appalling than the most dreadful sound in nature!

From what has appeared, we think the element of air is proved to be a fluid; that its presence is omnipresent, and its power omnipotent. Also, from what we have seen, we humbly conceive, there is room to believe that the opinion of Newton, with respect to the existence of a *vaccum*, is an erroneous position; and this we are bold to affirm, according to those laws which regulate aerial fluids, to be impossible. We, therefore, prefer the contrary opinion of *Descartes*, and his predecessor *Democritus*, for our own belief, who appeared to possess more correct ideas upon this subject.

The criterion of universal existence and general utility is that which induces us to assign this element the *first* place in the arrangement we have made of the materials used by nature. The reasonableness of which, we trust, may be apparent.

Further to illustrate the aerial principle, we judge it proper to add, as supplementary observations,

That air is *philosophically* believed to be a subtle and invisible fluid, with which this globe is every where surrounded, *Cic. de Nat. D.* ii. 36, on which depends the life of all animals, and the growth of vegetables; which, gravitating to the earth, thereby preserves objects which are upon its surface, and which may not themselves have sufficient gravity, from falling off from it. The air revolves with the earth in its diurnal motion, and makes an annual revolution around the sun in the society of that planet. The science which treats of air, and practically operates with or upon it, is called **PNEUMATICS**.

The ancient Stoicks believed the air pervaded every thing, earth, stones, &c. *Senec. v. 16*; and that the sun, moon, and stars, were nourished by the air exhaled from the earth. *Ibid.* *Galileo* first discovered the elasticity of the air; its weight was ascertained by *Bacon*. But these things were also known to the ancients, though less perfectly. Aristotle mentions a proof of its gravity, when he observes, that a bladder full of air weighs more than when it was empty.

De Cœlo. iv. 1. *Seneca* describes both its weight and elasticity. *Quæst. N.* v. 5 and 6.

The whole body of air is called the *atmosphere*. Its height used to be computed at 45 miles; now presumed to be 50 miles: but, it appears, that nothing certain in this respect can be settled upon, from various causes, chiefly the force of the electric fluid, which is thought to increase in proportion to the distance from the earth.

Beyond the atmosphere there is supposed to be a rare fluid, or a species of matter, called *ether*; infinitely more pure and subtle than the air which we breathe, and which forms the basis of the atmospheric air, of a most immense extent, according to Locke and all rational philosophers, filling all space where the celestial bodies roll, yet not resisting their motion: supposed by the Stoicks to be the origin of all things. *Quatuor sunt genera corporum vicissitudine quorum mundi continuata natura est. Nam ex terra aqua: ex aqua oriter aer: ex aere æther: deinde retrorsum vicissim ex æthere aer; ex aqua terra infima.*—*Cic. de Nat. D.* ii. 33. So *Ovid. Met.* xv. 239, &c. particularly of the sun, moon, and stars. *Cic. ibid.* 36—40.

The air next the earth is more dense than at a distance from it, because it is pressed by the whole weight of the air above, and also because it is more humid and less pure, being of an heterogeneous nature.

The air near the surface of the earth possesses a space about 1200 times greater than water of the same weight; and, therefore, a column of air 1200 feet high, is of the same weight with a column of water of the same breadth but one foot high. But a column of air rising to the top of the atmosphere is of equal weight with a column of water of about 33 feet high; for that is the greatest height that a pump, which acts by the atmosphere, can draw up water. The sucker of a pump has no force on water at a greater distance, and seldom at much above 32 feet.

The weight of the atmosphere, at the earth's surface, is found by experiments made with the *air-pump*, (an instrument invented by *Guericke*, a Prussian, about 1672, and greatly improved by *Boyle*,) also by the quantity of mercury which the air balances in the barometer, (invented by *Torricelli*, the disciple of *Galileo*, and professor of mathematics at *Florence*, anno 1643,) in which, at a mean rate, the mercury stands $29\frac{1}{2}$ inches high. Hence, it appears, that the pressure of the atmosphere upon every square inch of the earth's surface is equivalent to 13 pounds weight: and as the air, like other fluids, presses equally up and down,

and on all sides, it is computed that a middle-sized man, whose body contains about 15 feet of surface, supports a pressure of 32,400 lbs. weight of air all around. But because this enormous weight is equal on all sides, and counterbalanced by the spring of air diffused through our bodies in every part, it is not in the least felt by us.

The air becomes gradually more thin, as we rise above the surface of the earth, in such exact proportion, that the height we have ascended may be measured with great precision, from the sinking of mercury in the barometer as we ascend higher, the mercury falling at the rate of one inch for every 800 feet of height to which it is carried; but in great heights this method of calculation is found imperfect and uncertain, from various causes, chiefly the different temperature of the atmosphere. These uncertainties M. de Luc, of Geneva, has with much labour endeavoured to account for, and to remove; which Mr. Playfair, professor of mathematics in the university of Edinburgh, has ingeniously reduced to mathematical calculation.

Air is said to be heavy when it appears thick and foggy, but then it is evidently lighter than usual, from the mercury sinking in the barometer, and the clouds and vapour descending. This must, therefore, be a physical, or, perhaps, a vulgar delusion. The operation of several hydraulic machines depends on the pressure or gravity of air, as the common pump, invented by *Ctesibus*, of Alexandria, about 120 years before Christ, *Plin. vii. 37, Vitruv. ix. 9*, and greatly improved since. The real cause of its action, *i. e.* the gravity of air, was discovered by Galileo. Before that, its action was ascribed to nature's abhorrence of a *vacuum*. *Ctesibus* also invented a musical instrument, which went by the force of water, (*hydraulos, v.—es, v. hydraulicum organum.*) *Ibid. Athenæ, iv.*; somewhat similar to that which goes by the force of air, called "*Æolus' harp.*"

For decanting liquors, a *syphon*, or bended pipe is used with two unequal legs, the shorter leg being immersed in a vessel, and the air sucked out of the other, the liquor will flow till the vessel is emptied as far down as the syphon is immersed. On this principle, intermitting or reciprocal springs may be in part accounted for.

As various substances swell in moist weather and shrink in dry, hence instruments have been invented for measuring the degree of dryness or moisture of the atmosphere, called **HYGROMETERS**. 1st. From the lengthening or shortening, or from the twisting or untwisting of strings. 2d. From the swelling and contraction of certain solids,

especially those which are more regularly swelled by moisture and contracted by dryness. 3d. By the increase or decrease of the weight of such substances as absorb atmospheric humidity, as *sponges*, certain kinds of *paper*, &c. But few machines have succeeded; none to answer the purpose completely.

The elastic force of air is proved in a satisfactory manner from a machine contrived to discharge bullets with great violence and without report, called an *AIR-GUN*. The elasticity of the air is increased by heat, which dilates it to an amazing degree, whence the percussive force of gunpowder; and it is diminished by cold, which condenses it. On this effect upon air, is founded the construction of the air-pump, and its wondrous effects. Also upon this principle, and that of heat, the oblate spheroidal form of the globe is accounted for, causing a swelling between the equatorial tropics and an evanescence at the poles. And the various lengths required in pendulums in different climates, to ascertain time with certainty, are ascribed to the same cause. *Vide Memoirs of a Voyage for Astronomical Discovery, made by order of the French Court, in 1672.*

By filling a bag with inflammable air, greatly lighter than common air, is formed an *AIR-BALLOON*, first suggested by Mr. Cavendish, and afterwards practised by Mons. *Montgolfier*, of Annonay, near Lyons. The first experiment with this machine took place in Paris, June 5th, 1783. The first aeronaut was M. Rozier, at Paris, Oct. 15th, 1783.

As a Medium for Conveyance of Sounds.—Every impression made upon air makes it vibrate every way circularly, like waves upon a plain surface of water, when a weighty substance is thrown into it, each wave encircling every other in endless undulations. This undulatory motion of air agitating the *tympanum*, or drum of the ear, produces sound to the auditory sense; its celerity is increased or diminished in proportion to the quantum of force employed. Hence the diversity of sounds and their intensity when heard at different distances. Another distinguishing property of this fluid occurs, as the medium of sound, arising from the number of vibrations upon it in the body producing sound,—the mind receiving different sensations according to the different percussions made upon the ear: hence all the pleasing varieties in music. A musical tone depends upon the number of vibrations; which tone is the more *acute*, according as the returns in the air are more frequent, and the more *grave*, the less the number of those vibrations.

Concords arise from the agreement between the different motions of air affecting the auditory nerve at the same time.

When two tremulous bodies perform their vibrations in equal time, there will be no difference between their tones,—this agreement is the most perfect, and is called *unison*. If the vibrations are as 1 to 2, the consonance or agreement is called an *octave*; if as 2 to 3, a *fifth*, or *diapente*; as 3 to 4, a *fourth*, or *diatesseron*; as 4 to 5, a *ditonus*.

Pythagoras was the first who ascertained the proportions between musical sounds, he first reduced the wild melody of nature to a system, to which he is said to have been accidentally led, by observing the different sounds produced by the hammers of some smiths, beating out a bar of iron. This diversity of sound he found to be owing to the different weight of the hammers: then having adjusted hammers to express different notes in music, he next tried to produce the same proportions between the tones of musical strings, by applying different weights to stretch them. *Macrobius in Somn. Scip.* ii. 1.

Air is the proper vehicle of sound; for in an exhausted receiver, a bell when struck emits no sound: sounds are conveyed through water with nearly the same facility as through air: hence a bell sounds in water as well as in air; but with a deeper or duller sound. It has been a question whether fishes can hear. But, it appears, Dr. Monro has lately ascertained the fact of fishes having auditory organs; and he described the manner in which they are affected by sounds.

All sounds, loud and soft, move equally fast, at the rate of about thirteen miles per minute. The velocity of sound is to that of a brisk wind, as 50 to 1. An idea may be ascertained of the celerity of sound, by observing the flash of a cannon and *hearing* its report.

Smooth and clear sounds proceed from bodies that are homogeneous and of an uniform figure. Harsh and obtuse sounds from such as are of a mixed matter, and of an irregular form.

The strength of sound is greatest in cold and dense air; and least in warm and rarefied. Instances are not wanting of sounds being heard at the distance of near 200 miles in northern climates, and above 100 in more southern.

Sound striking against some object is reflected back, as an image from a glass; hence different echoes. When reflected from several places, like light, it may be collected into one point, as that, into a focus, and thereby increased; hence the *whispering-gallery*, the *speaking-trumpet*, *auricular tube*, &c.

Air, was anciently thought a simple fluid, and convertible into water. Its common operations were ascribed to its

heat or cold; its moisture or dryness; any other effects of it were thought supernatural.

Van Helmont, a Dutchman, first explained the nature of air extracted from different bodies, by fire, fermentation, &c. which he called *gas*; *ghest*, or *ghast*, spirit. Dr. *Hales* endeavoured to determine the qualities of air in different bodies, when he suspected that the sparkling of certain waters, as *seltzer*, *pyrmont*, &c. was owing to the air they contain; confirmed by *M. Venel*, of Montpellier, in France, 1750. Dr. *Black* discovered in certain bodies a fluid, called *fixed air*, which has introduced many discoveries in pneumatics.

It has been found, that vicious or bad air, diminishes the bulk of common atmospheric air, in proportion to its salubrity; the instrument invented for trying the wholesomeness of air, is called an *cudometer*.

Air impregnated with the fumes of certain vegetables, particularly vegetables in a putrid state, also from various minerals, from damp confined places, fermented liquors, melting metals, charcoal, and various other species of airs, particularly that in hot climates, from animal putrefaction, by disease or death, are all particularly noxious. It has been said, the plague is an effect of bad and unwholesome air; but this is highly questionable. (*See a subsequent article.*)

A child at its birth has no air in its lungs; after respiration has commenced, the lungs are never emptied of it entirely till death. It has been computed that in an adult of middling stature, 109 cubic inches of air remains in the lungs after the fullest expiration, and 179 after an ordinary expiration; and at each ordinary respiration or breathing, each adult draws in, on an average, 40 cubic inches of air. Thus the proportion of the dilatation of the lungs, before and after an ordinary respiration, is as 179 to 219 cubic inches. In a minute, the same adult breathes 14 or 15 times, whilst the pulsation of the heart and arteries amount to 60 or 70 in the same time.

Of air breathed at once, a twentieth part of the pure portion is on expiration found to be wanting; on breathing the same air a second time, more of the pure air disappears, and more fixed air takes its place. Hence an animal, confined in a small space, soon expires; and the air in which the animal has died is found to have lost very nearly the whole of its pure portion, its place being supplied with as much *fixed air*; that is, one-fourth part of the whole air breathed consists of fixed air instead of pure, the other three-fourths remain unaltered, being *azotic*, or bad. The lungs, we are

told, possess the peculiar property of rejecting bad air; therefore, with so small a proportion of pure air, or air proper for animal life, it is not to be at all wondered at to see an animal expire for want of a proper proportion of air to perform the economy, and answer the purposes of nature. Two of the inseparable qualities of air are *heat* and *cold*; which see. See also more of its theory in the article *Winds*.

II. According to our proposed arrangement, FIRE holds the next station. It will be seen to be entitled to it, judging by the position we have already laid down; for, second to air, its existence is unquestionably the most universal: of its amazing utility, we cannot for a moment doubt, when we reflect, that without it there would be neither animal, vegetable, or mineral life: also its existence, in some portion or other, pervades all space, and is found to be a component in all created materials.

The importance of this element in the creation was so strongly fixed upon the mind of *Pythagoras*, that, it is said, he went so far as to assert, that "All things were made of "fire;" without embracing this idea to that extent, which we should suppose was never meant by the philosopher, it is probable his expression had some limitations which are now lost: its import is also manifest to us, when we consider its general existence as a material in creation; likewise, when we reflect that there is no comfort in civil life, no convenience in mechanics, or the sciences, but what is to be attributed to this element, in a primary or subsidiary degree.

It is this which affords strength to the materials used in building us houses, for convenience and comfort; enables us to erect walls to cities; prisons for the dishonest, dissolute, and refractory; receptacles for the unfortunate; asylums for the wretched: to fire we owe the construction of ships, the manufacture of almost all the comforts, the necessaries, and elegancies of life, without number. We refer to the before-mentioned nature of elemental covering, for "*corpuscular atoms*," for an idea of its nature; but a volume might be written upon its nature, and the benefits we derive from fire, without exhausting the subject.

III. LIGHT has now our attention; that it should have appeared before, but for the reasons we have assigned, because our sacred records inform us, it was the first being which sprung from the creative fiat of Eternal Omniscience. Did not our reasons for the previous arrangement exist, its mention might be, perhaps, excused; for we find

it has not yet been considered as a primary existence at all by our predecessors. However, in this disquisition, we propose to make it manifest that it is entitled to this distinction, and in a superior degree ;—although its existence is most extensive, it is not so universal as either of the elements which have preceded.

The nature of light is generally very imperfectly described, and, consequently, appears to be worse understood than any other object : some make light as though it were a tangible substance, whilst others say it is a *mere effect*, owing its being to the existence of some other created substance : the latter opinion appears to be Newton's idea, who thus describes it, as consisting of “ an infinity of in-“ conceivably small particles issuing from all points of a “ luminous body, somewhat like sparks from a coal, in “ straight lines, and in all directions : these particles enter-“ ing the eye, excite in our minds the *idea of light only*.” Thus he makes light a mere non-entity, an optical deception, or at best but an existence in idea only : afterwards the same philosopher speaks of dividing this ideal existence, of its refraction, or being partially lost in other bodies, and reflexion ; which common experience every moment informs us actually happens to his *ideal* existence ; for it is refracted or submerged when it falls upon a cloud ; it is reflected, when it drops upon any polished and opaque surface ; but these terms, and the uses to which they are applicable, appear strange to us, should be used by a philosopher speaking of an ideal existence only ; that is, he appears rather inconsistent. The fact is, that here the great Newton thought and acted like a common man.

Nor is the conception of *Descartes* more satisfactory ; he thought “ that light is occasioned by the vibration of a “ subtle fluid ;” without defining a specific name, or genera, to its appellative epithet or intimating its precise nature. The fact will appear to be, that neither could have properly conceived ;—therefore, they could not give an adequate description.

We assume not superior information, but conceive that, to a certain extent, both these great men may be correct, from what we can collect from their doctrine. The Hebrew legislator and historian says light was created, which expression certainly implies it as having a *separate existence* : if so, it cannot exist in consequence of any previously created object, but must, of itself, exist independent of every other, and is, in consequence, purely ELEMENTAL ; yet that

fire yields light is an incontrovertible fact: it is also a truth, that there is light without heat or fire. Assuredly, the best mode to settle this disputed point would be to distinguish light into its various species: as *light, self-existing*, which must be presumed to be that kind of primitive light which had an existence anterior to the being of any luminous body, and must have been the CREATED LIGHT, of which the Hebrew historian speaks (*purely elemental*). Light, of the description of that described by Newton as issuing in particles or rays, from every part of some luminous body, may be properly termed *solar light*: that kind produced by domestic or familiar objects; as light from candles, lamps, gas, &c. may be called *domestic light*; and that species of light which proceeds from bodies without heat, as from the glow-worm, *ignis fatuus*, phosphorus, putrid fish, the Bologna stone, and carbuncle; all these bodies being capable of emitting light in the dark, are surely susceptible of a distinct name; therefore, Newton's idea may be its distinguishing specific term; he calls it *light without heat*. That all the species of light, except the first we have enumerated, have distinct causes for existence, some elementary, some dependent or consequent on other productions; likewise there is a *fifth* species of *light, proceeding from reflexion*, but without heat; as that chaste light yielded by the moon, and in her absence by the stars, which is a still more weak and softened light. That they are also all susceptible of distinction from their visible qualities, no less than for their original production, is a truth of which experience convinces us. But the preceding five distinct species of light form one generic nature only; philosophy has hitherto bowed too much to vulgar habits to adopt its common and confused idea, by expressing any and every description of light by *one* vague and uncertain term only.

Although of all these species of light there is only one of them entitled to the distinguishing appellation of an element, which must be the *first created existence*. And although a ray of solar light will pass through a *vacuum*, yet a domestic light will not burn in it, so essential to the existence of this kind of light, is air.

To define the nature of light will be, perhaps, infinitely more difficult; this we think must be regulated by its several specific effects, being, perhaps, as various as their objects are dissimilar. However, from what has preceded, some idea may be collected upon this head for its illustration.

Of every property of light, none is so truly astonishing

as its rapid transition, being calculated from observations made upon the satellites of Jupiter to proceed ninety-five millions of miles in $7\frac{1}{2}$ minutes!

The rays of light always proceed in straight lines, unless they are diverted and turned by some intervening object into some other direction.

Those rays, passing from one medium to another, may be inflected or diverted from a rectilinear course ; they are susceptible of division also; and are absorbed by various bodies, when they are said to be refracted : to illustrate this, a thin cloud is itself all illuminated by the solar rays, and in its turn, becomes a faintly luminous body ; those rays, however, which it emits are sensibly divided, and consequently weakened *solar* rays. This property of light is also called its *refrangibility*.

The ancients knew that a ray of light was bent, when it passed from one medium to another. They were led to this, from observing the appearance of a straight stick when immersed in water, the stick appearing to be bent ; the curve commencing at the precise point of the aquatic surface, on which *Archimedes* is reported to have written a book ; also from a small coin or any similar substance becoming visible at the bottom of a bowl or any vessel of clear water, when the eye is placed in such a situation that it could not have been possibly seen, admitting water had been absent.

It should seem, *Ptolemy*, was well acquainted with refraction : for he says, “ The light of the sun, moon, or “ stars, falling obliquely upon the gross atmosphere which “ surrounds the earth, are turned out of their rectilinear “ course, which causes these luminaries to appear to rise “ sooner than they do in reality.” He also ascribes the remarkably larger appearance of the moon, when near the horizon, to the same cause, and also the idea we conceive of their distance, from the vast multitude of intervening objects ; also, it is evident, that it is to this power in light, we have to ascribe the partial light the world enjoys in the absence of the solar luminary, called *twilight*, the occasion of which is ascribed to the reflexion and refraction of the solar rays upon the corpuscles or atomic particles of air and water found floating in the atmosphere ; as the body of the globe is not so completely intervening as to prevent the passage of those rays whilst the sun is only $18\frac{1}{2}^{\circ}$ below the horizon of the terrestrial surface, and for near the whole of the summer half-year, in the northern latitudes, he is in that situation. In the space or zone called the arctic circle, or

frozen zone, *i. e.* from $66\frac{1}{2}$ degrees north longitude to the pole, the sun in the northern summer is never seen to set, owing to the obliquity of the globe, and is never seen there, only by the effect of refraction, during the winter half-year.

The doctrine of refraction was discovered by *Snellius*, professor of mathematics at *Leyden*, and the cause of it more fully explained by his contemporaries *Descartes* and *Leibnitz*. *Grimaldi*, an Italian painter, first observed that the coloured image of the sun refracted through a *prism* is always oblong, or perhaps, elliptical, and that colours proceed from refraction. The complete illustration of this subject is said to have been left for the genius of *Newton*, who explained it, with the different refrangibility of the rays of light, to which his attention is said to have been directed whilst in the action of grinding optical glasses, in 1666.

The rays of light being thrown back by any opposing body, are said to be *reflected*; the bodies capable of such reflexion are opaque substances, and generally called *reflecting surfaces*. When they are absorbed by penetrating the surface of any body, they are then said to be *lost*, and sometimes they are *extinguished*.

Further, the rays of light are, like other small bodies, subject to the laws of attraction: *e. g.* if a stream of light be admitted by a small hole into a dark room, and the edge of a knife be exposed out of that line formed by the ray, the column of light will be directed from its natural course, and inflected towards the edge of the knife. *Refraction* is said to consist in this, that the rays are more attracted by a dense than a rare medium; by one colour more than another. Thus, light coloured bodies reflect, whilst dark ones absorb, the solar influence. Dr. *Benjamin Franklin* proved this, by laying various bits of cloth of several colours upon snow, when he discovered the dark shades attracted the solar rays in various proportionate degrees much more than those of a light nature, and black the most of any.

Rays proceeding from the same point as a centre, and continually receding from each other, are said to be *divergent*; those rays moving in the contrary direction are said to be *convergent*: their point of concourse is called the *focus*; the point whence they proceed is called the *radiant point*.

Parallel rays passing out of one medium into another of different density, and separated by a plane surface, will also be parallel *after* refraction, as may be seen in the instance of our perceiving the *natural* form of a coin at the bottom of a vessel of clear water, when the eye is placed as before

described, out of all possibility of seeing the object in a direct line.

Those rays which come converging from a dense medium into one more rare, become more convergent; if from a rarer medium to a denser, less convergent. So also, diverging rays going out of a dense medium into a rarer, become more diverging.

A ray of light, when it enters a different medium, is called an *incident ray*; and the angle it forms with the surface, is termed the *angle of incidence*. While it passes through the medium, after being inflected, or diverted from its former course, it is known as a *reflected ray*; and the angle it forms with the same surface, is called the *angle of refraction*.

A ray of light entering a dense medium from a rarer one, its velocity only, is *supposed* to be increased by the force of attraction, but it moves on in the same line, and is not refracted. If it enters obliquely, its direction becomes less oblique, to the surface of the medium; or, as is otherwise expressed, is *refracted towards the perpendicular*; that is, supposing a line drawn perpendicularly to the surface of the medium, through the point which the ray enters, and extended every way, the ray in passing the surface is refracted or bent towards the perpendicular line, or what is the same thing, makes a less angle with the perpendicular than what it did before.

The *twinkling* of the fixed stars is ascribed to the unequal refraction of light, in consequence of inequalities or undulating vibrations in the atmosphere, or of the region of vaporous particles floating in the air. But this twinkling has been also ascribed to the immense distance of the orbit of these stars from the terrestrial surface, and to the faint light they transmit; because the undulation of the atmosphere has not the same effect upon the most distant of planets.

The apparent concavity of the sky is only an optical delusion, owing to the incapacity of the organs of vision to take in very large distances; and its blue colour, to a mixture of the white light of the sun, blended with the darkness occasioned by the boundless extent of space beyond our atmosphere, or perhaps to the construction of air itself; which the ancients supposed to be *grey*; vide *Diodorus Siculus*,⁷ lib. i. c. 1.

⁷ The ancients also called the *air MINERVA*, whom they feigned to have been the issue of Jupiter's brain; they thought her a virgin, because the air is not

But the refraction of the rays of light are chiefly remarkable when the mediums through which they pass are separated by a spherical surface.

That portion of optics which treats of refraction and its laws, is called **DIOPTRICS**. Glasses used for assisting the sight in viewing distant objects, are called *Dioptrical glasses*.

In nothing have the moderns excelled the ancients more than in their discoveries concerning light, which is yet vastly imperfect, and in the invention of *optical instruments*.

Concave glasses for collecting the rays of light into a point, or convex ones for making them diverge, are called *lenses*; from their resemblance to the seed of the *lentil*, (*lens*), a kind of pulse.

Of lenses, there are five kinds: 1st. a *plano-convex*, i.e. plain on one side, and convex on the other; 2d. a *double convex*, convex on both sides; 3d. a *plano-concave*; 4th. a *double concave*; and 5th. a *miniscus*, or concavo-convex; i.e. concave on one side, and convex on the other like a watch-glass.

An oblong glass, with at least three plain sides, bounded by parallel lines, having both ends similar and parallel, is called a *prism*.

In passing through glasses plain on both sides, the direction of the rays is not changed. In passing through a convex lens, the rays converge towards each other, in proportion to the convexity of the glass; and in a concave lens the contrary; oblique rays, however, more than direct rays. Convex lenses also become burning glasses; with these the ancients are presumed to have been well acquainted; *Aristoph. in Nub. ii. l. 140. Plin. xxxvi. 67. xxxvii. 10. Lanctant de iri Dei. e. 10.*; and are thought by means of them to have lighted their sacred fire. *Archimedes* also is said to have constructed burning-glasses, or *specula*, (see a subsequent article,) which destroyed the Roman fleet before Syracuse, at the distance of a bow-shot. And *Zonoras* says the same thing was done at Constantinople, by one *Proclus*, under *Anastasius*.

When the rays of light passing through a single or double lens, are brought into their smallest compass, the point thereby formed is the *focus* of the lens.

By placing a convex lens in a small opening through the

subject to corruption; called also *Tritogenia*, or thrice begotten, because this suited with the ancient division of the year, into spring, summer, and winter. They also named her *Glaukopis*, as some believed from the colour of the eye, grey. But this author says, it is most probable, because that was the colour the *air assumed*.

window of a dark room, with a white paper at a proper distance opposite to it, is formed the *camera obscura*; and by placing a convex lens in a lamp of a particular construction, are represented the wonders of the *magic lanthorn* or *lantern*, in this there are usually a combination of lenses.

From the effects of convex glasses in collecting into a point the rays of light which pass through them, and then reflecting the images of objects, we may conceive the manner in which imagery is formed on the *retina*, a thin membrane, spread like net-work on the bottom of the human eye.

Should a small piece be cut out of the back coat of the eye, and a piece of thin paper put in its place, and the eye directed towards any object, an inverted picture of that object will be seen on the paper: whence, it has been supposed that children, or blind persons when they recover their sight, at first see objects inverted; but this does not follow; for there is no more connection between an idea in the mind and an erect figure, than an inverted one. The truth is, the doctrine of vision is not yet understood; neither how we see objects; nor why, having two eyes, we do not see double. The cause of the reflection of light, whereby we see objects, is alike equally uncertain: many hypotheses have been formed, but all unsatisfactory.

Several bodies refract, and at the same time reflect rays of light, *i. e.* receive part, and throw back others: as water, glass, diamonds, &c. chiefly regulated by the position of the luminary, of the eye, and of the reflecting surface.

That part of optics which treats of the laws of reflection, is called **CATOPTRICS**.

If a ray of light fall perpendicularly upon any object, as water, or a polished surface, it is reflected near the perpendicular, provided the luminary be perpendicular; but if obliquely, it will be reflected obliquely: or as is otherwise expressed, the *angle of incidence* is equal to the *angle of reflection*. With this, the ancients were likewise acquainted; and Aristotle thought that it is the reflection of light from the atmosphere, which prevents total darkness after sun-set, and in places where the sun does not shine in the day-time; and also that rainbows, *halos*, or circles round the sun, and mock suns, are all occasioned by reflection of sun-beams in different circumstances.

It was only in the last century that the different colours of the rainbow were accounted for, upon the principles of refraction and reflection from the rays of light falling upon small drops of rain in a particular direction.

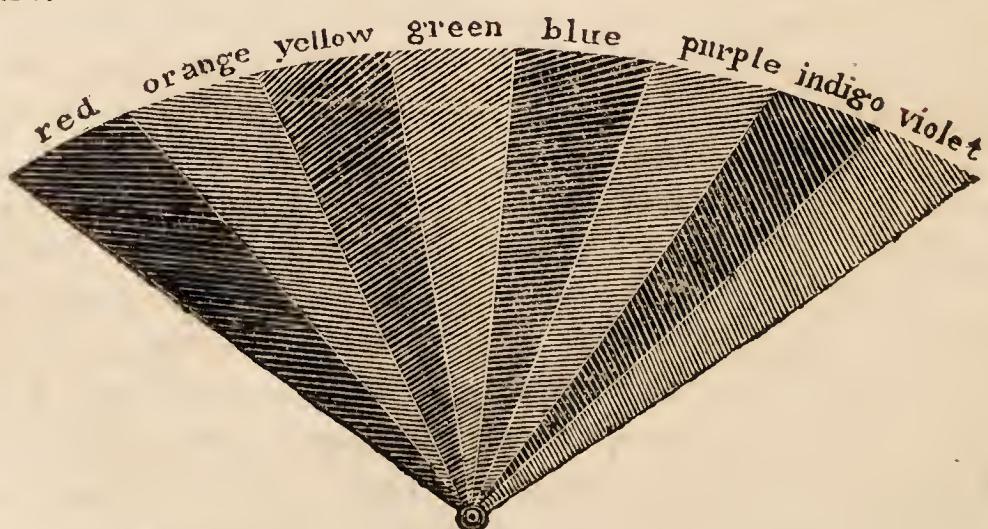
The different refrangibility of reflection of the rays of

light, are said, to excite in our minds only the idea of different colours;³ but we think this is highly questionable, inasmuch as we are at liberty to conceive a blue to be brown or black as what it is in reality; besides, all men *here* conceive alike, which position will not hold good with any other object in nature.

Those rays which do not differ from one another in refrangibility, are said to be *homogeneous*. Those which under the same circumstances are not equally inflected by refraction, are named *heterogeneous*.

That part of optics which treats of colours, is called **CHROMATICS**.

The opinions of the ancients concerning the cause of the diversity of colours, were various and uncertain. This matter is also said to have been rationally accounted for, by Sir I. Newton, who discovered that the rays of light, which to us appear to be perfectly white and homogeneous, are composed of no fewer than seven different colours, i. e. *red, orange, yellow, green, blue, purple or violet, and indigo*; and that bodies appear of different colours, according as they have the property of reflecting some rays more powerfully than others. Hence a body called black, is alleged to absorb all, or the greatest part of the rays which fall on it. If a table, having all those seven colours painted upon it, be made to revolve rapidly round, the table appears *white*; if the colours be repassed one over another with a brush, the paper appears black in that point where the colours have all been covered one over the other. Hence we humbly submit, the table, on account of the rapidity of its motion, may deceive our eyes, as does a conjurer, upon the same principles; but the instance of the colours upon paper naturally appears to be what it is, namely, that black is produced from an homogeneous admixture of all those colours.



Also these seven prismatic colours, as they are called, because discovered by that instrument, are all produced from three primitive colours, namely, *yellow*, *blue*, and *red*, mixed in certain proportions.

All these colours are conspicuous in the rainbow, and are beautifully exemplified in placing a perfectly circular bottle full of crystal water, so as to receive the rays of the sun; —and through a glass prism into a dark room.

The ancient poets believed that water was drawn up from the earth and its fountains by *Iris*, the messenger of *Juno*, i. e. of the air; *Ovid. Met.* i. 270.; which Iris, was also goddess of the rainbow: hence *Bibit ingens arcus. Virg. G.* i. 380. Thus the clouds were fed, and rains produced; *Lucan. iv. 79. Ovid. ib. Senec. Quæst. N.* i. 6. To which opinion *Plautus* humorously alludes; *Curel. ii. 41.* Clouds often appear very beautifully coloured, from their being composed of aqueous particles, between which air is presumed to be interspersed; and therefore they exhibit various colours, according to the different distances of the aqueous particles.

The opinion of many of the ancients, particularly of *Plato* and *Pythagoras*, approached very near to the celebrated discovery of *Newton*, concerning the nature of light and colours. They taught that colours were the effect of light transmitted from bodies, containing small particles adapted to the organ of vision; *Plutarch. Placit. Phil.* i. 15. iv. 13. *Qui (colores) quanum quodam gignuntur luminis ectu. Lucret. ii. 807, 754, 794, &c.* *Plato* has even declared the effects of a mixture of colours, and even says that two colours might be formed out of one; and while he points out the difficulties of the subject, and the merit of the person who should explain it,—he is said, as it were by the spirit of inspiration, to pronounce the noblest eulogium upon that idol whom Britain has set up and vowed to worship. *Plato in Timæo.*

The doctrine of *Descartes* concerning the instantaneous propagation of light, was maintained by some of the followers of *Aristotle*; who employed the same similitude with him to illustrate it: that as a long stick or string when stretched out cannot be moved at one end without being instantly moved at the other; so, if an impulse be made on a particle of the subtle fluid of light next the sun, it must be instantaneously communicated to all the other particles between the sun and the organ of sight.

Aristotle even explained why the rays of the sun, passing through a small hole of a square or triangular shape, forms

a circular image; which is said to have been first solved by *Marcelius* or *Marolle*, about the middle of the fifteenth century. The reason Aristotle assigned is, that the rays converge into a cone, whose base is the luminous aperture. *Aristotle, Prob. xv. 5.*

The appearance of the *Aurora Borealis*, or *Streamers*, some years ago, towards the north pole, has been presumed to proceed from electric matter in the atmosphere. This is, we think, questionable,—because there is now no such appearance: we feel more inclined to believe that it must have been produced by eruptions of *Mount Hecla*, or some other volcanic eruption in Iceland, or in some of the polar regions.

The ancients, although acquainted with the magnifying power of glass, (*Senec. i. 3.*) seem to have had no instruments of the optical kind, but *speculum*, or looking-glass, and glass globes filled with water. These, they are thought to have used in performing their minute works of art; indeed, we can scarcely conceive the possibility of executing them without such assistance. Thus Pliny mentions, on the authority of Cicero, that the whole *Iliad* of Homer was written on parchment, in so fine a character as to be contained in a nut-shell: *vii. 21.* So *Ælian* speaks of an ivory chariot, so small, and delicately formed, that a fly with its wings could cover it; and an ivory ship of proportionate dimensions: *i. 1.* Pliny also says, that in his time artificers made use of emeralds to assist their sight; which were made concave, the better to collect the rays, *concavi ut virum calligerat*; and that Nero used them in viewing the combats of the gladiators; *xxxvii. 5. s. 16.*

Seneca says, that the smallest letters, which could be scarcely seen by the naked eye, might be distinctly read through a glass tube filled with water, as the stars appear larger when viewed through a cloud; *Quæst. Nat. i. 6.* *Aulus Gellius* speaks not only of multiplying mirrors, but also of such as made the object appear as if inverted, *xvi. 18.*

The magnifying and burning power of glasses is supposed to have been also known to the Druids, from certain lenticular or spherical pieces of rock-crystal, (belonging to them, as it is thought,) which are still preserved in the cabinets of the curious.

The doctrine of refraction and reflection of light has been wonderfully improved and illustrated in modern times, by the invention and improvements of glasses; of these the most remarkable are the telescope and microscope, both refracting and reflecting.

The first telescope was made by *Zachary Janssen*, a maker of spectacles at Middleburg, in 1590; *Galileo*, professor of mathematics at Padua, heard of this discovery in 1609, but without seeing such an instrument, he set himself to contrive one of the same kind, in which he succeeded, and in a short time carried his improvements to a surprising degree of perfection. (See article *Astronomy*.) But it was *Kepler* who first explained the reasons of the effect of telescopes.

The reflecting telescope was invented by Mr. *James Gregory*, of Aberdeen, and improved by Sir Isaac Newton; but the greatest improvement in telescopes of the Dioptric kind was made some years ago by Mr. *Dollond*, who ingeniously contrived a method of correcting the defects of former instruments of this nature, arising from the different refrangibility of the rays of light, by the application of two different kinds of glass, possessed of different powers of refraction, and of different figures, so that the effects of one exactly counterbalance those of the other.

In a reflecting telescope, we never see the object itself, but only the image of it, which is formed next the eye in the telescope.

The magnifying powers of the reflecting telescope were wonderfully improved by Mr. Short, and have been astonishingly augmented by the present Dr. Herschel.

Dr. *Woollaston* invented an instrument which he called a *camera lucida*, somewhat similar in effect to the *camera obscura*, but differing from it in principle: his instrument takes in as much of an object as is reflected by the rays of light falling upon that object, operating like the convex pupil of the eye, the primary recipient; which faithfully reflects the same upon another lens, which in its turn conveys the object in just relative proportion and correctly true, in perspective, upon a sheet of paper placed in an horizontal situation, which acts as the *retina*, upon which the hand of the operator can trace the reflection, seeing it through another lens, although he is ignorant of the art of drawing. This instrument has recently been much improved by the very ingenious Mr. *Cornelius Varley*.

The microscope was invented soon after the telescope, by *Janssen* and his son, and in that age improved chiefly by *Lewenhoek*, a Dutch physician, born at Delft, in 1632, and died 1723. The microscope has much extended the sphere of human knowledge, with respect to nature and the properties of minute substances, as the telescope has in viewing distant objects.

Independent of those peculiar blessings which result to humanity from light, and all those comforts which man enjoys from this providential blessing. The beneficial effects nature receives from it should not be forgotten. Without the agency of light, all vegetable substances which form so large a portion of the creation most immediately useful to all animation, would be of one deadly monotonous livid white colour; a horrible paleness would pervade the entire vegetable world; in appearance somewhat like the heart of a cabbage, but without its healthy freshness; its vital bloom. The rose would be void of colour, the violet and tulip without their enchanting lustre. Neither would the variegated blossoms of the pear, apple, apricot, peach, plum, and other trees, which now we are accustomed to view, whilst in blossom, in every depth of colour and harmony of tint; all modified and softened in the most beautiful symmetry and admirable order of lovely gradation that can adorn elegant and useful nature — producing one grand and most beautiful whole. These would not exist but for the agency of light. The fruit of the peach, the plum, the cherry, and the apple, would be without its inviting hues, nor would its *bloom*, in virgin loveliness, exist. That beautiful general colour (*green*) of nature which now furnisheth so universal a feature in the complexion of vegetable life, a colour produced by the harmonious mixture of the extremes of spring and autumn, blue and yellow — those lively types of the infancy and age of vegetable nature, whilst the rich middle perfection of this colour affords the healthy green, — symbol of the adolescence of nature. These would not have being. In brief, nature would be without health, life, and spirit. The speculations of imagination, sanctioned at the same time by the actual experience of casual objects, might be amazingly extended, without a violation of truth; but what has been said may suffice. And we conclude this portion of our observations by remarking, that man cannot be sufficiently grateful to the divine Author of nature for the blessings which light affords.

IV. EARTH, properly and correctly speaking, is the terrestrial surface of the globe, at the same time we propose to include in this term all solid substances found in its interior, — comprehending, besides vegetable mould, clay, loam, gravel, and sand, all mineral natures, as well as vegetable and animal substances, because, on decomposition, they all resolve to the terrestrial principle.

Since physic, and particularly chymistry, is of so great

importance in natural philosophy, equal with mathematics in affairs of scientific truth, we prefer the writer who affords information regulated by this criterion. Such appears to be Mr. PARKINSON,⁸ who, besides giving us in most cases chymical resolution, as his design was to furnish particulars relative to the interior state of the earth; these considerations offer an additional reason for our preference.

Respecting the formation of several substances found in the interior of the earth, we now propose to speak: as, of the *nature and growth of stones, figured stones, diluvian stones, fossils, silica, rock crystals, alumine, clays, lithomarga, slate, chalk, tufa, marble, magnesia, forming steatites, asbestos, serpentine, sulphurets, pyrites, or marcasites, &c.* of bituminous substances, *peat, — coal, —* process and growth of fossils; many of which substances were mentioned by the ancients, consequently have had an early existence, as known to the world some thousands of years since; many of them having been noticed by *Xenophanes, Herodotus, Eratosthenes, Strabo, Pliny, Ovid, and others.*

The learned and very ingenious Mr. Parkinson says, in the third letter of his excellent work, on the “*Organic Remains of a former World,*” that in the earliest philosophical writings which have been transmitted to us, numerous proofs are to be found of the existence of substances which had, *even in those comparatively early ages of the world,* undergone the process of petrification. He says,

“**XENOPHANES**, the founder of the Eleatic sect, who wrote upwards of 500 years before Christ, maintained that God and the world were the same: he contended for the eternity of the universe. In support of which opinion, he dwelt much upon the circumstance of petrified shells being found in the internal parts of mountains, and in the bowels of the earth. He related that in the quarries of *Syracuse*, the impressions of fish existed; that the impression of a small fish was found deeply imbedded in a rock at *Paros*; and that almost every species of marine animal had been thus preserved; inferring from the appearance of these extraordinary phænomena, that these places must in distant ages have been covered with the sea.⁹

“**HERODOTUS**, who wrote 440 years anterior to Christ, speaks¹⁰ particularly of shells existing in the mountains of

⁸ See his *Organic Remains of a former World*, vol. i.

⁹ In *Origin. Philosoph.* cap. xiv. p. 100.

¹⁰ Lib. ii. sect. 12.

Egypt; and concludes from this circumstance, and the saltish emanations which injured the pyramids, that the sea had gradually retired from those parts.

“ *THEOPHRASTUS*, *the immediate successor to Aristotle*, in his school, was supposed to have written a book entirely on petrifactions; which, though ranked among his lost works, was imagined to have been in the possession of *Pliny*, and to have yielded him some assistance in that portion of his natural history.

“ *ERATOSTHENES*, who lived 200 years before Christ, when inquiring into the figure of the earth, also considered it as a question worthy investigation, — How it could have happened, that such vast numbers of oyster and other shells should be found scattered in many places at a very considerable distance from the sea. This phænomenon had also been noticed by *Stato* and by *Xanthus of Lydia*, as well as by *Strabo* himself, who refers to and corroborates their remarks, in the first book of his *Geography*; particularizing some of the species of shells thus changed, and the places where they are found.

“ That those substances which had undergone this extraordinary change existed upwards of 2000 years since, in quantities so considerable as to have excited the attention of the Grecian historians, philosophers, &c. is therefore very evident. So prodigious and so extensive were the effects they noticed, that we find almost all of them contending for the eternal duration of the world; finding it difficult to conceive any period of time, in which the changes they had noticed, at once so vast and extraordinary, could be accomplished.

“ In the works of *Pliny*, who wrote near 1800 years ago, and in that part of his writings which, probably, are much indebted to the work of *Theophrastus*, who himself wrote about 300 years before Christ, we find mention of several substances which *subsequent* observation has taught us must have undergone the process of petrifaction. Among the most remarkable of these, he speaks of the *bucardia*, like to an ox's heart; *brontia*, resembling the head of a tortoise, supposed to fall in thunder-storms: *glossopetra*, like a human tongue, which do not grow in the earth, but fall from heaven whilst the moon is in its wane; *hammites*, like the spawn of fishes; the *horn of Ammon*, possessing with a golden covering the figure of a ram's horn; *lepidotes*, which intimate in various colours the scales of fishes; *meconites*, resembling the poppy; *ceraunia* and *ombria*, supposed to be thunderbolts; *ostralites*, which, though harder

than the shell, bear the name and resemblance of the oyster; *syringites*, which are formed with cavities, by which they resemble the pipes of straw; *spongites*, bearing the form of sponge; *phycites*, resembling sea-weeds or rushes.

“ He also speaks of a black light substance resembling wood; that Theophrastus speaks of fossil ivory, both black and white; of bones born in the earth, and of stones bearing the figure of bones.

Ovid tells us,

*Vide ego, quod fererat quondam solidissima tellus,
Esse petum. Vidi factas ex aequore terras:
Et procul à pelago conchæ jacuere marina;
Et vetus inventa est in montibus anchora summis.*

Metamorph. lib. xv. l. 262.

“ *Alexander ab Alexandro*¹¹ says he remembers to have seen, in the mountains of Calabria, at a considerable distance from the sea, a variegated stone of hard marble, in which many sea-shells, but little changed, were heaped, forming one mass with the marble. He also relates that *Jovianus Pontanus* informed him, that being once on the promontory of *Pausilyppus*, near *Naples*, he saw in the middle of a piece of stone, which was broken from the rock by the violence of a tempest, a wooden beam surrounded on every side by stone, and grown into one body with the rock.

“ *Tertullian*¹² also, anxiously endeavouring to prove from natural appearances, that a general deluge had, according to scripture, taken place, dwells particularly on the remains of marine animals on mountains, and on various parts of dry land, at a considerable distance from the sea.

“ For several succeeding ages, the writers of natural history were, at least with respect to their accounts of these substances, little more than mere copyists of *Pliny*; who, although he had affixed names to these substances descriptive of the forms they possessed, meant not thereby to give any opinion as to their origin.

“ In the thirteenth century, *Albert le Grand*¹³ spoke of the branch of a tree being found, in which was a bird’s nest with birds contained in it, the whole being a mass of stone. The *vis formativa* of *Aristotle* was, however, sufficient to account in the opinion of *Albert* for this extraordinary phenomenon. But the opinions which were entertained at this

¹¹ *Genialum Dieorum*, liber quintus, 1532.

¹² *De Pallio*, cap. ii. p. 6, ed. *Salmas*.

¹³ *Mineral Tract*, i. lib. 1.

period, respecting these substances, were exceedingly incorrect. The doctrine of equivocal generation which had been adopted by the disciples of Aristotle, contributed very much to mislead those who made these substances the subject of their inquiries; since by also adopting the aid of certain occult qualities, their origin was supposed to employ their influence in the earth, in creating substances which bore the figure and resemblance of various vegetable and animal substances. To account for their formation, therefore, it was thought sufficient to refer to the hidden powers of the *vis plastica*, the *vis formativa*, and the *vis lapidifica-tiva*.

“ In the sixteenth century, the workmen employed in rebuilding the citadel of Saint Felix at Verona, discovered that the rock on which it was built was full of petrified shells. This discovery excited the attention of the learned to a very considerable degree; some attributing them to the active influence of the *vis formativa*; whilst others, perceiving their exact resemblance to real shells, declared they must be actual marine bodies thus enveloped in stone by some accident. We learn, that when *Fracastorius* was asked his opinion respecting the phænomenon, he made for answer, that it had been attempted to be accounted for in three different ways. Some attributed it to the *vis plastica* and *formativa* of Aristotle; others supposed these substances to have been real marine bodies deposited in these places at the general deluge; whilst others adopted that opinion to which he himself was most inclined, that those parts where these marine bodies were found, had formerly been covered with the sea, which gaining insensibly on some parts of dry land, gradually changed its bed, leaving the positions it had formerly occupied for the cultivation and possession of man.¹⁴

“ In the sixteenth century, *Agricola*, to whose indefatigable spirit of inquiry mineralogy is very much indebted, spoke more explicitly of extraneous fossils than had been hitherto done. He particularly mentions the *entrochi*, and relates several instances of trees, and parts of trees, being found in a petrified state at considerable depths in the earth.¹⁵ But, it is evident, that *Agricola* was not partial to inquiries respecting extraneous fossils; his attention was chiefly engaged in mineralogy, to the promotion of which his industry added very considerably.

¹⁴ Bonani Musæum Kircherianum, p. 198. Musæum Calceolarii et Musæum Corn. Moscardi, p. 172.

¹⁵ De Ortu et Causis Subterr. lib. iii.; et De Natura Fossil. lib. vii.

“ In 1565, *Conrad Gesner*, published at Zurich a work of great merit, *De Rerum Fossilium Lapidum, et Gemmarum Figuris*. About this time John Kentman, a German, collected a cabinet of petrifactions, which, considering the period in which it was formed, appears to have been very respectable. The catalogue is contained in Gesner’s work. About the same time, *Valerius Cordus*, a celebrated physician, undertook to publish a general oryctography of Germany; but does not appear to have received such encouragement as would have warranted the prosecution of his plan.

“ Towards the close of this century *Bauhin* formed a copious collection, and published the necessary descriptions, of the petrified shells which were found near the baths of Boll. This descriptive catalogue is found in his *Historia Novi et admirabilis Fontis Blaneique Bollensis in Ducatu Wirtembelgico, Montballard*, 1598.

“ About the same time, *Michael Mercatus* wrote his *Metallotheca Vaticana*, which was not, however, published till the year 1717, when it was given to the public by *Lancisius*, physician to the Pope. The opinions of Mercatus not differing from those which prevailed in the age he wrote, are not indeed very interesting: but the notes of Lancisius, and the figures, which are executed in a very masterly manner, and convey very accurate ideas of the bodies they represent, render the work of value.

“ In the seventeenth century, collections of fossils became more general; only two catalogues of collections had hitherto appeared, now several new ones were published. In 1622 appeared a copious description of the celebrated museum of *Calceolarius* of Verona; and twenty years *subsequent* was published the catalogue of *Besler*’s collection. In 1652 appeared *Wormius*’s catalogue; in 1663 was published *Spencer*’s; and in 1666, *Spatiala*’s. An account of the museum of the King of Denmark was published in 1669. In 1674, *Cottorp*’s catalogue appeared; and in 1679, was published that of the very celebrated *KIRCHER*. In 1687, *Dr. Grew* wrote an account of the curiosities which are contained in the Museum of *Gresham College*; and in 1695, appeared the catalogue of *Petiver*, an apothecary of London, who had, at a vast expense, formed a most valuable collection.”

The preceding particulars are copied for the sake of affording those who might be desirous of further information of the history of fossil productions, an opportunity to consult the chief and most valuable works which have appeared

on this head. Of which number, also, are those authors briefly mentioned, as follows: Nic. Steno, in a dissertation *De Solido intra Solidum Contento*, published in 1639, at Florence, displays a considerable degree of sound judgment in his inquiries respecting fossil remains. The *Musæum Metallicum* of the indefatigable and illustrious Aldrovandus, published in 1648, contains descriptions and delineations of many fossil bodies. The work of Augustino Scilla, *De Corporibus Marinis Lapidis centibus*, published at Naples, 1670, also contains considerable information, the result of most careful and anxious inquiry. About the same period, several learned men undertook to publish the Oryctological History of several parts of Germany, Italy, &c. Caspar Schwenkfeld, who, in 1600, published a catalogue of fossils discovered in Siberia: but the most intelligent writer of this period was Francis Columna, who, in 1616, published his treatise *De Glossopertis*. Those of Hildesham, by Frid. Lachmund, and of Switzerland, by Jo. J. Wagner. About the same time, a dissertation by J. Don. Greyer, at Frankfort, *De Mantibus Conchiforis et Glossopertis Alzeyensibus*. And at Leipzic, a dissertation by Albertus, *De Figuris variorum Rerum in Lapidibus et Speciatim Fossilibus Comitatis Muffeldiae*. Nor were the fossils of this country neglected; the *Lithophylacti Britannici Ichnographia* of Lhwyd, published at Oxford, in 1669, contained a very ample catalogue of English fossils contained in the Ashmolean Museum. In 1664, was published by Thomas Lawrence *Mercurialis Centralis*, or an Account of Subterraneal Cockle and other Shells in Norfolk. Several English fossils are described in Dr. Plott's Natural History of Oxfordshire, published in 1686; in the Natural History of Northamptonshire, by Dr. Morton; and in Dr. Leigh's Natural History of Cheshire, Lancashire, and the Peak of Derbyshire, &c. &c. But particular notice is invited to Dr. Woodward's Natural History of English Fossils, who supported the present general opinion concerning their production, *i. e.* "that they consisted of marine shells, &c. originally, which, by the petrifying power of certain waters, were changed into either metallic or stony bodies;" but an exception appears to be made to the Doctor's theory, inasmuch as he thought the waters of the deluge which had immersed these substances, possessed the peculiar property to dissolve rocks and admit those productions into their interior. Mr. Parkinson very ingeniously confutes this opinion, by observing, that if the water was so great a solvent, the substances themselves must have been also dissolved. Merret's

Pinax Rerum Naturalium Britannicorum, first part published in 1667. *L'Histoire des Singularites Naturelles d'Angleterre, d'Europe, et du Pays de Galles*, by Mons. *Childrey*, published at Paris, at about the same time. Valuable information on this subject will be also found in the works of the celebrated *RIESKE*, Major *Kirchmajor*, and *Sachs*, also *Wolfgang, Wedel, &c. &c.*

A Geological Description of the INTERIOR of the EARTH. — We premise the following brief outline to answer general description only; necessity enforces belief that certain local situations will require a more particular description. An infinite number of especial peculiarities will of course demand a more definite and accurate detail.

Generally then,—the very intelligent and learned author of the “Organic Remains of a former World,” informs us, in his fifth Letter, vol. i. that “It presents every where a surface more or less irregular,—in some places gentle risings and declivities only are found;—in others, the elevations are vast and lofty, accompanied with appropriate valleys. In some parts, the dry land is interrupted by slight intersections for the currents of rivers, which stretch into immense continental tracts: whilst, in others, prodigious excavations in the substance of the earth serve as the receptacles of immense oceans of water. These, it is allowed, exceed, in the sum of their extent, that of dry land; and bear a very near proportion in their depth to the height of the highest mountains.

“Mountains are with propriety divided into primitive or primeval, and secondary or epizootic. The primitive and secondary mountains differ, not only in their composition, but also in their form.

“The primitive mountains are composed of granites, and stones of the granite class; of porphyry, jasper, serpentine, sand-stone, trap, and sometimes, but more rarely, of lime-stone, fluors, gypsum, &c. These substances sometimes lay in strata; but more frequently they are found in huge blocks. Thus a granite mountain, about thirty miles from the Cape of Good Hope, called the **PEARL-DIAMOND**, rises out of the ground to the height of 400 feet, being half a mile in circumference, and formed of a block of granite.

“These mountains never cover secondary mountains, but are often covered by them. They are commonly the highest ridges in any chain, and terminate generally more narrow and sharp than the secondary.

The most distinguishing character of these mountains, according to Mr. *Kirwan*, is, (a circumstance peculiarly

inviting the attention of the fossilist, and of no less import to all who are desirous of seeing the sacred Hebraic records established, beyond the possibility of sceptical doubt,) that eminent naturalist says, "No organic remains are to be found in the interior substance of the stones of which they are composed." Mr. Parkinson proceeds.

"*Secondary Mountains* are generally marked by a softer outline, and possess the distinctive character of being composed of, or at least retaining within them, the fossil remains of organized substances. They always rest on, and sometimes cover primary mountains; and sometimes, very commonly also, they lean on the sides, or invest the primary. The secondary mountains are formed like the primitive, of either one species of stone, or of strata of different species.

"Some are said to be derivative; being supposed to have originated in the disintegration of primitive mountains. The substances of which these secondary mountains are chiefly composed, are lime-stone, swine-stone, marlite, chalk, and gypsum. They are also sometimes formed of indurated clay, lithomarga, jasper, porphyry, trap, siliceous sand-stone, and other substances, which belong to the primitive mountains.

"The various strata of which the earth is composed, as deep as the curiosity, and the necessities of man have induced him to explore them, manifest, in the most striking manner, the wisdom displayed in the arrangement of the materials which compose the present world. The first layer, generally consisting of a rich black mould, is formed entirely of the remains of innumerable animals and vegetables, which having lived through their destined periods, have been resolved into their primitive principles. This substance laying at the surface, where alone it would be of utility, yields sustenance to the whole vegetable kingdom; and thereby becomes the actual, though not the immediate support of man, and of the rest of the animal creation. Beneath this, is most commonly found a thick bed of clay," which (besides serving as an immense reservoir, from its adhesive consistency, to hold the superfluity of rain and other moisture for the support of vegetative life,) "yields the material of which bricks, tiles, and various species of pottery, and innumerable other articles, adapted to promote the comforts of social life, are formed. Next to this, in general, vast beds of gravel appear, intermixed with pebbles, varying in their size and form; and with this is also commonly found the finer gravel, which likewise varies, in

different parts, in its degree of fineness and in its colour. Underneath, there are infinitely varying strata of sand, sand-stone, lime-stone, &c.; which serve, with the trunks of trees which have grown in and been nourished by the first layer, and with bricks and tiles made from the second layer, to supply the materials of which the dwellings of man may be composed. They also serve, with the sand and gravel of the third stratum, to supply that kind of surface to the earth in those parts which are most inhabited by the civilized part of mankind, such as may best contribute to the comfort, and expedition of the intercourse which must necessarily take place between the inhabitants of distant parts.

“ These strata of stone varying perpetually in their colour, solidity, and texture, form in some places the ceilings and floors of the vast subterranean caverns which are found in various parts of the world, and which often contain, as do those particularly in the principality of Bayreuth and in the Hercynian forests, very interesting specimens of those remains which constitute the research of the fossilist. They also form the surrounding parts of those mines, which contain the valuable metals, and which civilized man forms into innumerable articles of utility and ornament. Beneath *schistus*, or slaty strata, are generally found beds of *COAL*, so necessary to the comfort, and in some situations to the convenience of man. These strata do not always follow each other in regular order, since sand and gravel are sometimes found at a considerable depth, and *trap*, or *rag-stone*, is often interposed between them in various directions.

“ In almost all these strata, even to a very considerable depth, the remains of vegetables and animals, which have existed in former remote periods, are frequently found; and in general possess the same physical and chymical properties, and are composed of similar constituent parts with the strata themselves. What these constituents are, becomes, therefore, an object of necessary examination.

“ Of the first stratum of mould, sufficient hath been already said for our present purpose.

“ *Clay*, which I have reckoned the second stratum, has for its basis the earth called *alumine*, or the earth of clay, which constitutes its real agrillaceous part. This earth readily combines with acids, and forms the salt called *alum*, by its union with the sulphuric acid. It hardens to a very considerable degree in the fire; but does not fuse, unless combined with lime, or certain salts containing phosphoric acid.

The other ingredient in the formation of clay, is siliceous sand, of which I shall presently speak more fully. From the various portions of these two substances, from the different degrees of their respective purity, and particularly from the admixture of iron, and of some of the other earths, proceeds a considerable variety in clays. Those which are most likely to come under our observation, are the *lithomarga*, formed by the finer clays in various degrees of induration; and *fuller's earth*, an agrillaceous substance, deriving a saponaceous softness from its containing a portion of magnesia.

“ *Trap, rowley-rag, toad-stone, or wacken*, are stones in which agrillaceous matter very much predominates. These, from the manner in which they are diffused through the subterraneous regions, and from the peculiar structure which they possess, have been supposed by many to be of volcanic origin.

“ *Schistus, or slate*, is also a mixture in which alumine very much predominates. It also contains the earth of flint and magnesia. It is found to vary considerably in colour and texture, according to the degree of its purity, and the different proportions of its constituent parts.

“ *Silica, or siliceous earth*, i.e. the earth of flints, is the chief constituent of the pebbles and sand which form the third stratum I have mentioned. It is difficultly acted upon by any acid, except that which is obtained from the Derbyshire fluor spar, termed fluoric acid. It is, however, very powerfully operated on by the alkalies, which promote its fusion; and when combined with it in a certain degree, form glass. It is the earth which chiefly forms the common *flint*, and *ham-stone*, the more pure *chalcedony*, and the still purer *quartz*, or *rock crystal*; the variously figured *agate*; the arborised *moches*; the beautifully marbled *jasper*; the sportive *Egyptian pebble*; and the finely veined *wood-stone*, still retaining the marks of every fibre which regulated its pristine structure. Combined with a certain proportion of alumine, it forms the chief constituent of the *amethyst*, *topaz*, and various other stones, which from their brilliancy, hardness, and colour, are estimated as gems. This earth, also, chiefly helps to constitute the *granite*, of which the primitive mountains are formed. This stone frequently displays, in a most beautiful and distinct manner, the three substances of which it is composed. The *feldspar*, the constituents of which are silica, alumine, and magnesia, will be seen generally in oblong forms, and like masses of various sizes. The *mica*, composed of the same con-

stituents, but in different proportions, will appear generally in grains about the size of a pin's head, of different colours, but most commonly black; and sometimes in white flakes of a metallic lustre. The *quartz* will be found interspersed between these, generally of a greyish colour; and appearing to be the medium by which the other substances are agglutinated together.

“ *Lime* is the earth which chiefly forms the various lime-stones, which are placed in different layers beneath the beds of clay and sand. This earth is rendered tolerably pure, when, by intense heat, it is made into *quick lime*. It fuses when combined with flint and clay, and readily combines with acids. It is soluble in 700 times its weight of water, forming the liquid called *lime-water*. From its caustic qualities, and its solubility in water, it is now generally considered as an alkaline substance.

“ From the combination of lime with carbonic acid, formed by the union of carbon, the chief matter of charcoal, and of the diamond with oxygen, or the acidifying principle, proceeds *carbonate of lime*. From this substance,—according to its different degrees of purity, and modes of combination, is formed *chalk*, a substance which requires no description.

“ *Tufa*, a light porous substance, chiefly deposited in water, in which it has been diffused.

“ *Lime-stones* of various colours and textures are employed in paving, and for various purposes of architecture. Marbles are finer kinds of lime-stones, possessing a closer texture, and being capable of assuming a good polish.

“ *Calcareous spar*, named according to the form of its crystals, *i. e.* lenticular spar, dog-tooth spar, &c.

“ *Alabaster*, formed by the deposition of calcareous matter in the clefts of rocks, from the water in which it was suspended.

“ *Stalactites*, formed on the roofs of subterranean cavities, by the gradual secretion of similar matter, from water filtering through the more porous lime-stone.

“ *Stalagmites*, formed by the deposition of the same matters on the floors of caverns.

“ By the admixture of lime with clay, are formed various *marls*, existing sometimes in a soft bubuerescent state, and at other times possessing the hardness of stones.

“ By the union of sulphuric acid with lime, is formed *gypsum*, or *selenite*, a substance generally of a white colour, and exhibiting a slight degree of lustre and transparency. By intense heat, the lime is obtained from this substance in a state of considerable purity, when it is termed *plaster of*

Paris; and when combined with the acid, termed *fluoric acid*, the substance called *fluoric spar* is formed, more generally known by the name of Derbyshire spar.

“ With the phosphoric acid,—an acid originating in the animal kingdom, lime also frequently combines to form *phosphate of lime*; by this combination is also formed *phosphorite*, a stone, found in large masses, chiefly in Spain and Germany.

“ Lime has been supposed, by those of high authority, to have been entirely of animal origin. This, however, cannot be admitted, although it is indisputable that a considerable portion of it has passed through the animal kingdom. Vast masses exist of animal remains resolved into this earth, which still retain sufficient of their pristine structure to point out the form they had originally borne.¹⁵

“ *Magnesia* is a very light substance, and soluble in 1000 times its weight of water. The various stones in which magnesia predominates, almost always show its presence by a smooth and unctuous feel; this is peculiarly the case with the various *steatites*, or *soap-stones*, also with *basalt*. They also, sometimes, manifest a flaky structure, as is the case with *common talc*. Sometimes they display a striated texture, with a lustre of the silky kind, as in the *amianthus*, and in the *asbestos*, the stone of which may be made incombustible cloth.

“ *Serpentine*, a stone, which from the disposition of its colours is supposed to resemble somewhat the serpent, and which has rather a soft and somewhat of a greasy feel, with a silky texture, is composed of this earth, with a certain quantity of silica, and a very small portion of iron.”

Sulphuret of metals, and particularly that of *iron*, found at various depths, and frequently entering into the composition of several fossils, demand a few words. These are the substances commonly known as *pyrites*, or *marcasites*, and are formed by the intimate union of sulphur with some of the metals, *commonly with copper*. They in general shine with a brilliant metallic lustre; and when they do not, frequently suffer decomposition on exposure to the action of air. On saturation they take fire, and burn spontaneously with a blue flame.

Since *coals* form so considerable a source of human comforts, and are so important a subsidiary medium to the

¹⁵ In the British Museum there is preserved a very rare specimen of a limestone rock, containing the form of the spine and ribs of a human being, which was discovered in the island of Guadalupe.

accomplishment of a variety of useful purposes, and as they form an important article of commercial intercourse in the British world: also, since the observations which are to follow, will tend to develope a considerable mystery in nature; and as that feeling is laudable which desires information upon so rational an object;—we now subjoin from the same author, the process of *bituminization*, or the formation of peats, coals, &c. which the author denominates **BITUMINOUS FERMENTATION**, defining it to be “*A fermentation peculiar to vegetable matter placed in such situations, as not only to exclude the external air, and secure the presence of moisture, but prevent the escape of the more volatile principles; and which terminates in the formation of those substances termed bituminous.*” He says, “this is the first time the process has been distinguished as a species of *fermentation*;”—proposes to ascertain it by subsequent observations, observing, “In a process carried on in the recesses of the earth, or at least in situations from which our observations are excluded, it is not to be expected that a complete history of all the phænomena which occur during the whole process can be possibly made out. To furnish a satisfactory account, we must have recourse to inference and analogy; thus aided, we may, perhaps, with only the product of the operation before us, be enabled to form well-founded conjectures on the phænomena which have actually taken place.

“Almost all vegetable matters manifest a strong disposition to decomposition, when the separation of their integral molecules, is aided by the interposition of particles of water; and, particularly, if with this is combined the powerful energy of caloric. If this latter agent be employed only in a low degree, an intestine motion among the integral molecules takes place; they become influenced by new attractions, and then enter into new combinations and modes of existence. Thus a revolution of the original compound is effected, and new substances are formed, differing much in their physical as well as chymical properties, from the substantial as well as essential qualities, whence they once proceeded. One particular point, in which they almost always differ, may be here very properly noticed. The combinations resulting from these spontaneous changes, occasioned by the intestine motions of the constituent principles, regularly produce substances less compounded than those which these principles previously formed. Before the final change, however, is completed, certain regular periods in the process must be passed through; and the substance exposed to the operation, must necessarily exist in several intermediate states. In passing through these intermediate

states it necessarily acquires new and peculiar characters; and may be arrested in any one of these stages of transformation, and so fixed, that it shall pass on to no farther change."

Predisposed as we feel ourselves, to be directed by the excellently well-informed, and truly scientific Mr. Parkinson's judgment, we subjoin his definitions of bitumens: however, since these *natural mineral* substances differ from those produced by *bituminous fermentation*, which will be remembered, they are here distinctly described as **BITUMENS**, which he arranges into seven several classes.

I.—“ **NAPHTHA**, *oleum terra*, which Mr. *Hatchett* considers as bitumen in its greatest purity, is a thin yellowish, but sometimes a colourless oil, of a strong, but not disagreeable odour. It is so highly inflammable, that it catches fire even on the approach, without the common contact of flame, and on combustion leaves scarcely any residuum. Its specific gravity may be taken at 84.75 from *Brisson*. It does not freeze at 0° *Fahrenheit*. It is insoluble in alcohol. By exposure to the air, it becomes yellow, and then brown, and at the same time acquires a degree of consistency, passing into petroleum. It is found in great abundance in Persia, sometimes on the waters of springs, and sometimes issuing from certain strata.

II.—“ **PETROLEUM** is a tenacious, brown fluid, which, according to the length of its exposure to the air, increases in thickness, and in darkness of colour, until it acquires nearly the viscosity of common tar, its smell at the same time becoming less pleasant. In this state, although highly inflammable, it burns with a flame less clear and white, yielding soot, and leaves a small quantity of coaly residuum. Specific gravity 87.83. *Brisson*. It is also found in Persia and likewise in many parts of Europe.

III.—“ **MOUNTAIN or MINERAL TAR**, is the name given to this substance when it has acquired the consistency and colour of common tar. It emits a strong bituminous smell on being burnt. Specific gravity 1.1.

IV.—“ **MINERAL PITCH** and **MALTHA**, are terms employed to mark the different degrees of colour and consistency, which this substance possesses, in its degrees of inspissation. Whilst so soft as to possess some degree of tenacity, it is called—

V.—“ **MINERAL PITCH**, but when it has become almost black and so hard, as neither to stain, nor adhere to the fingers, it is termed *maltha*. Its specific gravity varies with its degrees of induration, and the quantity of earth it contains.

VI.—“**ASPHALTUM** appears to be the same substance in its highest degree of induration, it is a light brown or blackish substance; brittle, showing when broken a conchoidal fracture, with a glassy lustre. It manifests a bituminous odour, when rubbed or heated; it melts easily, and is very inflammable, burning away, when pure, without leaving ashes. Its specific gravity, according to Kirwan, is from 1.07 to 1.65.”

Dioscorides calls this substance *pissaspphaltum*, which *Pliny* defines, because of its being mixed with pitch.

VII.—“**MINERAL CAOUTCHOUC**, or **ELASTIC BITUMEN**, appears to differ from mineral pitch in its degree of elasticity only, and is supposed to be in consequence of a different situation in which air is placed in one body, which distinguishes it from the other; presumed in this to be deposited in its internal cavities.”

“ Between the phenomenon of fermentation in general, and those which result from that which I term the *bituminous fermentation*, I trust you will perceive a total agreement, when the latter are more particularly examined. But that this may more clearly appear, I will proceed to take a more particular view of the effects of this process, with those proceeding from other species of vegetable fermentation.

“ Vegetable matter, then, I consider as subject to five different species of fermentation, each of which appears to be in a great measure dependent on the degree to which the access of air and water is admitted.

1st.—“ The *saccharine* fermentation takes place in those parts of vegetables, in which the saccharine principle seems to be present or to predominate, and merely to require evolution, as in the roots of the parsnip, beet, &c. the monocotyledon seeds,” &c. Likewise in grass, “ this principle acquires a saccharine form, by the attraction of oxygen from the atmosphere, during the germination of those seeds; in which state it is preserved, by the common operation of malting. From other parts of vegetables it is obtained by chymical processes. The saccharine fermentation appears to be the agent by which fruits acquire an increase of sweetness after being plucked from the parent stock, when no action of vegetable life can go on.” Such is the case with cut grass. “ By acceleration of this process, and by the aid of caloric, in the operation of baking, this effect is still more manifestly produced.

“ If to vegetable substances, possessing this principle, an addition of water be made, and a slight increase of caloric

ensues, an intestine motion soon takes place, called from its process,"—

2d.—The "*vinous fermentation*. During this process, the object of which appears to be the diminishing the dose of carbon, which is united with the oxygen and hydrogen in the sugar, we find carbonic acid gas is rapidly separated, a feculent sediment is deposited, and a new substance called *yeast* or *must* is formed, which rises to the surface, and which, if added to any vegetable infusion containing the saccharine principle, will immediately excite that particular intestine motion, on which this species of fermentation depends.

" When this fermentation has taken place, but whilst the fermentative motion is still discoverable, if the fluid be carefully preserved from the access of air, passes on through an almost, and in the latter stage of it, an entirely imperceptible fermentation, during which it obtains its highest degree of strength, becoming a clear and bright spirituous and intoxicating liquor.

" But if instead of this seclusion, the process be allowed to go on, in contact with the atmospheric air, instead of a spirituous liquor, a peculiar vegetable acid, or *vinegar*, is the result; which will also require for its preservation, seclusion from the atmospheric air, since otherwise it will suffer a farther decomposition, its volatile part escaping, and its earth and carbon only remaining.

" Thus, also, will almost any mass of dead vegetable matter exposed to the air, or the atmosphere, soon pass into"—

3d.—" The *putrid fermentation*, by which its constituent parts will be made to enter into new combinations. The hydrogen, uniting with the oxygen, is either volatilized in water, or combining also with a portion of carbon, is separated as carburetted hydrogen gas, the remaining portion of hydrogen giving colour and odour to the mass. Of the carbon, that which is not engaged with the hydrogen, either unites with the oxygen, and forms carbonic acid, or constitutes a part of the magma, of which, however, by far the most considerable portion is earthy matter, which entered into the composition of the vegetable.

" But if, instead of being thus exposed to the influence of the air, a mass of dead vegetable matter be accumulated in such situations as allow of the admission of water; but in which, by the compactness of the superincumbent stratum of earth, not only the external air is shut out, but the disengaged gaseous matters are prevented from escaping, the—

4th.—“ *Bituminous fermentation* takes place; and bituminous matters are found in various degrees of maturity and pureness, according to the stage at which the process may have attained, or the extraneous matters which may have been admitted. But I do not, however, wish you to forget,” a former observation, “ that at the taking place of the process I have here described, I am not able, for the reason already given, to adduce direct proof; the proofs of its existence must be obtained by inference, and from analogy.

“ This I shall now attempt, and shall hope that, by comparing it with other species of fermentation, and by examining the results of the process, we shall be able to form more reasonable conjectures as to the nature of the new combinations into which the principles have entered.

“ The substance then which I consider to be entirely dependent on, and actually the produce of this process is *bitumen*; a substance which manifests, upon examination, all those properties, which might *à priori* be expected to be found in a body constituted under the particular circumstances, which I have presumed to direct its formation.

“ In the first stage of the vinous fermentation, we perceive that a considerable portion of the most volatile parts of the mixture is dissipated; and that it is only by the careful preservation of the remainder that the accomplishment of this process is effected. In the acetous fermentation, this escape of the volatile parts is continued through the whole of the process, and occasions the great difference which exists between the two products. In the first of these species of fermentation, carbon, that principle which always seems to effect that mode of combustion observable in ignited charcoal, where flame is not present, is, we have remarked, dissipated in very large quantities, by which its dose in the mixture must be considerably diminished; whilst, should hydrogen even be supposed to escape in a similar proportion, still, from the decomposition of the water, sufficient of this principle, which I will call the principle of inflammability, will be yielded, to give the spirituous and very inflammable product which we find to be the result of the process. In the latter of these species of fermentations, in which the dissipation of the volatile matter is carried to the utmost extent of which the degree of temperature will admit, the mixture appears to be deprived of almost the whole of its hydrogen, except, perhaps, just so much as is left in the combination with the colouring principle, and the water, whilst the oxygen is attracted, nearly in the same proportion, by the carbon

from the atmosphere, and from the very considerable dose of the acidifying principle; and, from some peculiar modifications of their union, the product *vinegar* results, possessing a high degree of acidity, but not the least degree of inflammability.

“ We shall now examine the changes which may be expected to result from the decomposition of vegetable matters placed in subterranean situations, and considering these, with the properties which are possessed by the supposed product of the bituminous fermentation, we shall be enabled, especially by recollecting what has just been said of the other species of fermentation, to determine whether it is right to admit the existence of such a species of fermentation or not.

“ Secured on every side by the surrounding earth, the mass of vegetable matter is preserved, as it were, in a well-closed vessel; hardly any escape being permitted to any of its more volatile particles, nor any admission of extraneous matters allowed, except of such as are introduced with water, which may insinuate itself by soaking through the interstices of the earthy particles composing the several strata which enclose it. It is denied that a strong disposition to separate, and to unite in another order, shall secure the decomposition of dead organized matter, which, according to the economy of nature, is to possess but a short and transient cohesion. Agreeably to this law, this mass of vegetable matter, now deprived of the energy of vegetable life, must undergo some change; but from the closeness of its preservation, it cannot admit that escape of the gaseous matters on which the commencement of the vinous, acetous, or putrid fermentation depends; another process is therefore instituted. The hydrogen, carbon, and oxygen, are disengaged from their former attachments, but being prevented from flying off in a gaseous state, are obliged again to unite, and to enter into new combinations. Under these peculiar circumstances a substance may be expected to be formed, containing a considerable portion of these principles, so abundant in vegetable matter. In this respect there, undoubtedly, may be discovered a remarkable agreement between the supposed product of this fermentation and the hypothesis by which its formation is attempted to be explained; since in all bituminous substances, the abundant existence of these three principles have been sufficiently proved by analysis.

“ In this, as in every other species of fermentation, a considerable difference may exist as to the degree of perfection to which the process may proceed, and of course

as to the degree of perfection which the product may possess. This I expect to show, that according to length of time, exclusion from air, and the existence of other favourable circumstances, will these bituminous substances be found in their several approaches to that state to which the laws of nature appear to have designed them.

“ PEAT, that combustible and inflammable substance, generally found in considerable masses at a little depth beneath the surface of the earth, possessing chymical properties essentially different from every other substance which has not derived its existence from the same origin, appears to be the *first* product of this kind of fermentation, and to have been formed in situations not favourable to the rapid completion of this process. The celerity with which this process is accomplished, must depend on the closeness with which the gaseous principles are secured ; but it should be considered that such peat-bogs which are but of comparatively modern formation are covered with a coat of vegetable mould in a humid state of no considerable thickness ; and therefore the escape of the more volatile principles, and the admission of atmospheric air, is only partially prevented ; the process must, therefore, be carried on with much less effect than in those cases which will be hereafter mentioned, where vast masses of vegetable matters have been suddenly buried beneath considerable thicknesses of earthy deposition.

“ The existence of abundance of hydrogen, carbon, and oxygen, in peat is demonstrable by analysis. By the early analysis of Schoekius we learn, that it yields an oil much resembling the oil of amber, with an acid liquor. M. Fourcroy relates, that on exposing peat to the action of heat in a distillatory apparatus, a yellow or reddish fetid water is obtained, an oil of a most disagreeable odour, with carbonate of ammonia, and carbonated hydrogen gas, also smelling most disagreeably ; a coal being left which is frequently phosphoric, and which yields after incineration, muriate of potash mixed with sulphate of soda, and of potash mixed with phosphate and sulphate of lime, and with the oxides of iron and of manganese.¹⁷

The prevalence of hydrogen in this substance is fully displayed by the formation of this peculiar oil ; but a considerable quantity of this principle is also disengaged in a gaseous form ; the agreement, therefore, between this substance and what might, *à priori*, have been supposed would be the product of vegetable matter placed under

¹⁷ Syst. des Connois. Chem. tom. viii. p. 233.

these particular circumstances, appears to be evident. The original mode of existence, which belonged to the substance is sufficiently marked by the great quantity of vegetable substances which are found in it, and which have not suffered such an alteration as to hinder the immediately tracing of them to their true origin. That this substance has been subjected to the influence of the two circumstances which seem essential to this peculiar fermentation—the presence of moisture and subterranean situation—must appear so evident, from what has transpired before," (in a former letter,) "of the state in which peat-mosses are found, that on this point not another word need be added. Peat, therefore, I presume we may regard as a vegetable secondary fossil, having been formed from vegetable matter changed in its nature and properties by certain fermentation which has been carried on in the mineral regions."

To show the susceptibility of the hardest of vegetable substances (*Trees*) suffering a change of material by *bituminization*, like those vegetables of a more delicate texture; and because it is of the same class of change with peat concretions, and as these may perhaps serve as a medium link between that substance and jet or cannel coal, the observations of this close observer of the operations of nature are subjoined.

He first states the circumstance of the actual existence of such substances as *fossil-trees* imbedded in peat, when he thus proceeds to establish the mode of their having become in the mineralized state in which they are found. "When first discovered, these trees are generally of a dark brown colour, manifesting, as already mentioned, the exact form of an original tree, but so soft as to be capable of being deeply cut into with a spade, and also of so spongy a texture, as to allow a very considerable quantity of water to be squeezed out of them, even by moderate pressure, yet displaying considerable attachment to water. So tenacious are they of the water they have imbibed, as still to retain a very large portion of it, even after great pains have been taken to procure its expulsion: but when, after long exposure to the air, this water has been evaporated, the substance of these fossil trees assumes different degrees of solidity, dependent on the state in which the wood at first existed, at the time of its exposure to the bituminous fermentation, and on the extent to which the operation has proceeded. Should the texture of the wood have been loosened by previous decay, it will, in its bituminous state, when dry, be found to be in a loose and shattery disposition, the fibres being hardly discoverable, owing to their

having concreted into irregular fasciculi." The appearance which such pieces exhibit may be conceived, from a representation he furnishes.

" But, on the contrary, if the wood had endured little or no previous decay, nor had suffered any loss of substance from agitation of the water in which it had laid, and has undergone the same degree of bituminization which peat in general has suffered, it will, when dried, not only possess its pristine form, but almost its original degree of hardness. Slips of this bituminized wood will flame, when lighted, like matches made from fir or pine tree, which has occasioned some confusion; some having asserted that the trees, from whence these slips have been taken, must of necessity have been of the resinous kind, from their possessing so great a degree of inflammability after ages of immersion in water. This phænomenon, however, is more easily accounted for, by considering that this substance no longer possesses any of the original compound constituents (*matiériaux immédiats*), of which turpentine is one, but that the inflammability depends entirely on the wood being now converted into a bituminous matter, which circumstance is evinced by the particular odour and other peculiar circumstances which accompany the combustion of this substance."

We doubt the metamorphosis of the particles of wood, but readily admit the phænomenon of transmutation may be supplied by the cavities of it being all so completely filled, that to casual observation, the substance may have appeared to have suffered an entire change.

" Bituminous wood, sometimes possessing a considerable degree of closeness of texture, has been very advantageously employed for many purposes, to which ordinary timber is appropriated. From its adoption for such purposes, an observation has been made, which deserves here particular notice. The experience of the workmen has led them to remark, that this species of fossil-wood resists the action of water much longer than other wood; they, therefore, choose to employ it in those situations which are most exposed to injury from that element. Here we perceive an instance of the powerfully pervading influence of this species of fermentation—trees so little altered in their structure as to bear all the ordinary operations of hewing, &c. in the same manner as common timber, yet found to be so far bituminous to the centre, as to become, when dried, in a considerable degree impenetrable to water, a property possessed by all bituminous matters, after being once dried, in proportion to that degree of perfection to which their bituminization has proceeded.

“ That leaves of plants and other soft substances should suffer very considerable change by this or any species of fermentation to which they are subjected, is not so difficult to understand; but that large and solid trunks of trees should be penetrated to the very centre, and that too in the hardest substances, at the time it affords matter of wonder is solved, by reflecting on the very powerful agency of water, which when existing in a separate state, or as one of the constituent parts of the substances exposed to this species of change, appears to be indispensably necessary in this as in all other species of fermentation. It is well known, that by the long-continued immersion in water of a piece of timber, the particles of water may be made to insinuate themselves through every part of it, and when the water is impregnated with the leaven of fermentation, this will of course be conveyed to every part, and this may account for so wonderful a change being effected through the whole substance. Hereby we discover that this effect, so astonishing at first view, is accomplished by the twofold action of the water; first, by separating, by its interposition, the integral molecules of the wood; in producing which effect, it is, perhaps, aided by the combined action of a portion of caloric; and, secondly, by conveying to every point of the vegetable substance the leaven of the bituminous fermentation, by the active energies of which fermentation, the whole mass of solid wood is said to undergo an actual conversion, and to pass from a state of wood to that of bitumen.”

The ingenious author further illustrates this principle in the change of substance in woods, by fermentation, to a bituminous nature, from analogy, by observations upon the well-known practice of hay-making; which he observes “ when conducted agreeably to the wishes of the farmer, that the saccharine fermentation, or a fermentation very nearly resembling it, takes place; and the grass is changed into hay, which possesses a peculiar fragrance and sweetness. But should the grass, at the time it is heaped together, unfortunately retain too much moisture either in its saccharine sap, or from extraneous humidity, very different effects will follow: heat will be rapidly evolved, and a dense vapour will be seen to proceed. If the process be stopped in this stage, the mass of vegetable matter will be found to have acquired a dark brown colour and glazed surface, and to emit a strong peculiar odour resembling empyreuma, or of bitumen. In this state, it is generally known by the term *mow-burnt hay*.” There is also another stage in the process of destruction of hay in the stack, occasioned in

consequence of there not being a sufficiency of dry material intervening between the earth on which hay stands and the hay itself; when it will be discovered that the caloric occasioned by the congregated vegetable has drawn the humidity from the earth, occasioning what is known as *mouldy hay*, which appears as the first step towards its actual and final decomposition. But if the process be suffered to proceed, the heat soon considerably augments, the vapour becomes smoky, and actual flames soon burst forth, when the whole mass is presently reduced to ashes.

“ The remarkable and frequent evolution of heat just spoken of,” he says, “ demands an inquiry whether any thing similar ever takes place in the process of bituminization; since if that be not the case, the parallel would fail.” But as the process of bituminization is carried on out of the reach of ordinary examination, it is impossible, as previously observed, to speak correctly as to the phenomena which take place in its process.” However, to prove that the effects are similar, he cites a letter from Peter Collinson, Esq. to Sir Hans Sloane, among the unprinted papers of the Royal Society preserved in the British Museum, which shows that this phenomenon may arise during the process. This writer, it appears, accounted for the occurrence upon similar principles to those which our author has adopted.

“ Our newspapers, printed here, mention the burning of
“ brooks in the vale of Good Cheap; but the case is, that
“ some pieces of marshy ground, called *brooks*, from their
“ watery situation, have flamed for some time; and these
“ they have called *burning brooks*; the parish next adjoining
“ is also called **BROOKS**. The soil is like those parts
“ of Cambridgeshire where the turf is cut, and very often
“ under water; but this dry season has brought it from very
“ wet to that degree of moisture which often causes *hay* to
“ ferment and take fire. Accordingly this fire begins
“ about four feet under ground, just above the water, (as
“ appears by digging,) and so burns up to the surface where
“ it flames out, especially if stirred by any thing; and
“ according to the quantity of roots and peat it meets with,
“ it leaves strata of black coal or red ashes. The fire has
“ now burnt for several weeks, and is expected to continue
“ till rain or springs extinguish it. The same land burnt
“ about forty years ago. Perhaps this hypothesis of its
“ kindling by fermentation, may be confirmed by the fre-
“ quent firing of hay-stacks this year, of which we have
“ many more instances than in several years before.”

He then cites the authority of Schoockius, whence, it is learnt, that this species of combustion is no rare occurrence

in the peat-pits of Germany. "More or less frequently," he says, "it happens, but chiefly when the heat has been most violent,¹⁸ and the rains have fallen plentifully, that either by accident or some one's malice, not only the dry peats, but even the marshy earth itself, become drier than usual, is set on fire, when the flames spread far and wide, occasioning a calamity no less dreadful to those labourers who dwell at the pits, whose little hovels it lays waste and reduces to ashes, than to those who derive their livelihood from these pits. For this reason, proper watchmen are appointed to go round, not merely to keep it together in heaps, but to be ready to extinguish in time the fire which might break out. This they do, not so much by water as by smothering it, by turning over it with shovels the adjoining earth. If this be not done, the flames gradually acquiring more fuel, the fire ravages not for a few days, but for weeks, and even months, as dreadful experience has shown, so that an extended plain may be regarded as a lamentable kind of volcano."

There are various opinions respecting the original formation of peat. Some have supposed it to exist from the creation, and, consequently, to be a separate and integral existence. Mr. Parkinson says, his opinion opposes this,—observing, "that it is composed of a vegetable substance," or rather substances, we presume; "which bears the indubitable marks of having existed in another state; and also, that there are abundance of instances to prove that the process of its formation is going on even at this day."

"At the same time," he alleges, "that the hypothesis which presumes it to have been a bituminous deposit from the waters of the sea, must be rejected, from improbability; and, in part, for a similar reason."

Likewise, the opinion of Pliny, and after him adopted by Schoockius, of its being originally a mineral, and being at the first formed in its present situation, appears to have come from *Aristotle*, and to be distant from that truth established by present appearance. Some, it appears, have endeavoured to account for its formation, on the idea of its being originally the substance which composed floating islands, which they allege to have been deposited in peat situations; but this idea appearing to have little or no claim upon credible probability, we shall

¹⁸ See also opinion of *Diodorus Siculus* to nearly the same fact, with respect to the escape of air on a sudden change from cold to heat, lib. i. c. 1. He says, when accounting for the generation of animals on the *Mochæan* theory of creation, "Pustules wrapt up in thin and slender coats and skins, which may be seen in standing ponds and marshy places; when after the earth has been pierced with cold, grows hot on a sudden without any visible alteration."

dismiss this subject, by presuming that it has been already satisfactorily accounted for.”¹⁹

The most prominent circumstances in the last note are, the materials of which these islands are chiefly composed; the gaseous matter which is so plentifully liberated from an opening made into its substance by means of a pole; and the extraordinary impulse and agitation by which the water of the lake is affected. These several circumstances are proposed for careful investigation.

All, except about two feet of the upper part of these islands, appear to have been formed of the decayed leaves and of roots and trees; and such, Mr. Parkinson says, we well know is the appearance which is yielded by *peat*, in certain periods of its formation. Let us now suppose, that after some considerable time, and after having been covered by various strata, this peaty matter should be discovered; it might then, perhaps, be found to be well formed peat. Should also any favourable concurring circumstances, contribute to

¹⁹ Speaking of floating islands, this judicious author affords a description of those occasionally found in the lake of Derwentwater. “ The lake of Derwentwater is celebrated for the astonishing phænomena its waters exhibit. At uncertain times, the waters of this lake experience very considerable agitations, the waves running to a great height, and forming large white breakers, on which the boats are tossed as though in a severe storm; whilst none of the causes of such commotions of the waters are discoverable. The waves differ from those produced by ordinary causes; not rolling along from one end of the lake to the other; but rising in mountainous heaps, as though raised by some powerful elevating force applied underneath: and in agreement with the idea thus suggested, the people of the neighbourhood term this a *bottom wind*. Sometimes the whole surface of the lake is thus agitated, at other times it is only partially affected; and frequently it will strike a boat with so much force, that it will appear as though it had struck against a rock: a very considerable roaring noise often accompanying these surprising appearances.

“ A phenomenon not less interesting and astonishing is the appearance of the floating islands themselves upon the lake. These rise, at uncertain periods, from the bottom of the lake: sometimes one, and sometimes two, have risen in a year; at other times, several years may elapse without their appearance. Their time of remaining at the surface is also very uncertain; some sinking again within twenty-four hours; whilst others remain for six weeks, two months, or even longer, before they return to the bottom of the lake; which they in general do without having suffered any change in their form: but sometimes they burst and are so widely rent, that boats can pass between the separated parts. One rose in 1798, which was one hundred and eighty yards long, and fifty yards wide.

“ They sometimes show above a foot high of land out of the water; and some have been measured which have been seven yards in thickness.

“ The upper part of these masses, for about two feet in depth, is common mud; beneath this, it becomes less compact, and the remainder is found to be formed of decayed leaves and roots of plants and trees.

“ A pole being passed three or four feet into them, a considerable quantity of air rushes out on its being withdrawn: this air smells like gunpowder: and it is said, that if collected in a bottle, it will take fire if exposed to the flame of a candle.”*

bring down the history of a floating island having existed on this spot, the vegetables growing on this might be supposed to have furnished this vegetable matter, now existing in an altered state; whereas, we have seen, that the greatest part of this mass was composed of such matter, at the time it existed as a floating island.

This mass of decayed leaves and roots of plants, and of trees, as described by the ingenious observer, "was undoubtedly a mass of long-buried vegetable matter, part of a stratum of peat *passing through the bituminous fermentation*. The opportunity of its separation having been given by the superincumbent strata, and having been so reduced by the excavation which formed the lake, as not to have a sufficient thickness or strength to resist the expansive powers of the detached gaseous matters, which, for the completion of the process, would have been required to be closely confined.

"That this bituminous fermentation was actually going on, may be reasonably inferred from the nature of the gas which was disengaged, its peculiar odour, and imputed inflammability; strongly denoting the presence of hydrogen; the separation and subsequent fixation of which have been assumed as important steps in *this* process. Another circumstance yields very strong collateral proof that this operation had proceeded to a certain length. The specific gravity of all bituminous substances is generally less than that of the vegetable substances from whence they have been formed;" this he alleges to have been the case, when *wood* has endured the process. As this operation has gone on, the substance has become specifically lighter, and cavities have been formed by, and distended with detached hydrogen, which must have also increased the levity of the mass, and enabled it, even with the superincumbent weight of earth, to make it ascend through the water.

It may be here remarked, although it must be very apparent, insomuch so, as to render any remark superfluous,—that the eruption of these gaseous matters in considerable quantities, is sufficient to account for the agitation of the waters, and for the other phænomena, which are described as appearing to produce some powerful elevating force underneath.

From the variety of observations, the result of the steady and experienced inquiry of different minds, which have preceded, without going further, we think it is sufficiently established to warrant our coming to this conclusion, that —*peat is a species of acervation or congregation of vegetable substances casually deposited, still retaining a sufficiency of*

moisture to answer the purpose of fermentation; which fermentation consists in the action of the leaven producing heat, this bitumen operating on the substance, aided by the various species of air discovered in all existing bodies, causes a separation of the vegetable oils, or most unctuous parts of the plants, which unction constitutes a vegetable produce, somewhat similar to the mineral, the pure NAPHTHA of the ancients; the previous operation producing a fresh substance, called bitumen. This bitumen has the power peculiar to all unctuous natures, to render foreign objects, of a vegetable nature also, as wood, of qualities similar to its own: one of which appears to be its leading feature, is the communication of this unctuous principle to all surrounding objects. Of which bitumen there are various species of the same generic character, previously described; denoting, perhaps, its different stages of existence. This original deposition of these substances having created by fermentation, that leaven, as properly termed by Mr. Parkinson, a sufficiency of which is at all times remaining to impregnate fresh supplies of vegetable substances constantly falling into this receptacle, so, in part, is a fresh supply brought in, and a constant fermentation is going forward.

By way of reconciling an apparent contradiction existing between Mr. Parkinson's opinion and an hypothesis of Dr. Anderson; the former taking it up on the principle just given, whilst the latter believes the *peat moss* to be distinct species of vegetative perfection, and in its fossil state to be in as high a degree of perfection as that species of vegetation is capable of attaining;—we observe, that the fact is notorious, that two substances can produce a third, distinct in its properties from either of its originals; this is so well known, that it will be superfluous to adduce instances: but since any two or more substances unite in the production of a third, or other nature, so they may also produce one analogous to their own properties, so we regard the substance called peat moss to be; whilst it is specifically distinct from every other species of production: this generating in the peat soil furnishes an infinity of small fibrous roots, which afford a degree of consistency to the entire mass.

This is, we humbly conceive, the mode by which peat earth is first produced, constantly generated, and supplies provided to answer every diminution occasioned by the necessities of man for this species of fuel.

It is now time to speak of the formation of coal, which we do, taking our *data* from the same very ingenious author. The opinion of Pliny, and after him of Schoockius,

being founded upon the *vis plastica* and the *vis formativa* of Aristotle, perhaps, require not serious consideration; these doctrines being now justly exploded, by the superior information of modern chymistry, and the rational observation of well-informed and scientific men.

That the purer bitumens have all had nearly the same original as peat, that they have been all produced by the same species of matter, combinations, and by the same natural process, has been shown; and that the only difference exists in having been separated by percolation from the grosser parts, seems to be proved, in the opinion of Mr. Parkinson, by the frequency with which they are found together, but more particularly in the exact agreement observable in their *chymical properties*. In perfect agreement with peat, as well as with other bituminous substances, as has been justly remarked on the vinous fermentation; the purer bitumens are composed of *hydrogen*, *carbon*, and *oxygen*; but, as might have been expected from the circumstance under which their fermentation has taken place, no escape of the volatile principles having been admitted; the new compound appears to be a result of a high degree of concentration of these principles. The great degree of inflammability possessed by all bitumens, manifests the large quantity of *hydrogen* which they contain; and the blackening of the clear and colourless naphtha, on exposure to the air and light, shows the hydrogen to be saturated with *carbon* and *oxygen*, since on the destruction of the equilibrium, by the escape of a portion of hydrogen, or by the attraction of an additional portion of oxygen from the air, the carbon and oxygen unite, and form the *black oxyde of carbon*, or charcoal is formed, by which the fluid becomes gradually darkened: and suffering a proportionate degree of inspissation, at the same time, it acquires the degree of consistence, as well as colour, by which PETROLEUM is characterized. It is easy to conceive, if the principle itself be admitted, on which it has been stated the change of *naphtha* into *petroleum* depends, that by its extension we may discover whether from the gradual darkening of this substance and the inspissation of petroleum into mineral tar; and this if the same process be continued, into *mineral pitch* or *maltha*, and this again into *asphaltum*.

Although in this manner, perhaps, the formation of dark coloured indurated bitumens may proceed; yet, it is observed, indurated bitumens are of divers colours, from the straw coloured *amber* to *jet*, in all gradations; to account for this variety of tint, and, at the same time, the transpa-

rency of bitumens, should be essayed. It has been suggested the colouring of naphtha depends upon the increase of its relative proportion of carbon and oxygen, manifested by the deposition of the oxyde of carbon, the inspissation of charcoal may take place in various degrees, according to circumstances. Thus on one hand, whilst the naphtha retains its primitive subterraneous situation, it may come in contact with the sulphuric acid, which readily yielding its oxygen to the carbon, and at once gives it darkness of colour; but, on the other hand, where no excess of oxygen is present, the more fluid parts of the bitumen may gradually exhale, without its undergoing any decomposition or alteration in the original proportion of its principles; and thus may the lighter coloured and harder bitumens be produced. To Mr. Hatchett's discoveries in the chymical nature of bitumens, and their various changes, this ingenious author confesses his obligations; who appears to have ascertained that the progressive change of naphtha to petroleum, mineral tar, mineral pitch, and asphaltum, proceeds from the disengagement of carbon. Thence he believes originates the change of colour, the degrees of inspissation, the increased proportion of carbon found in these substances by chymical analysis. By this observation, Mr. Hatchett, however, means only relatively to be increased, in respect to other ingredients, in a given quantity of these bitumens, and that it predominates in proportion to the dissipation of a certain portion of hydrogen, which was originally necessary to the forming of the bitumen conjointly with the carbon.²⁰

To account for the origin of *amber*, first a postulate is assumed, that it is bituminous; its analysis manifests its properties: exposed to the fire it liquifies, if heat be strong, softening and bubbling, without running into drops; which circumstance distinguishes it from resins: inflamed, it diffuses a thick smoke with a pungent odour. Its flame is yellow, variegated with blue and green: after combustion, it leaves a black shining coal, yielding by incineration a very small quantity of earth, mixed with a slight proportion of iron. Thence he, Mr. Parkinson, would be led without hesitation to seek for its formation in the subterranean laboratories of nature; both for its bearing accidental but equivocal marks of having existed during some of the stages of its process, either actually on or very near to the surface of the earth. He next examines the opinions of various naturalists respecting its origin. *Theophrastus* speaks of amber

as a stone dug out of the earth in *Linguria*, and which possesses a power of attraction. His translator and commentator, Sir John Hill, gives it as his opinion that it is a native fossil. *Dioscorides* thought it to be an exudation from the black poplar. *Pliny*, who particularly notices this substance, supposed it to run from the trunks of trees resembling pines, in the same manner as resin flows from pines, and gum from cherry-trees; thence he imagined it derived its name, (*succinum*,) from *succus*, a juice. He thought this opinion was confirmed from the smell it yields when rubbed, and the bright flame with which it burns. *Dalechamp*, the learned annotator on this author, observes, in that part of the world which appears to yield amber, there are no trees which can be termed resinous; but, he observes, along the northern shore there is certainly a kind of *yellow BITUMEN*, as well as a *black* kind, to be found about *Auvergne*, and that from it proceeds a *yellow naphtha*, as well as from the other comes a *black PETROLEUM*.

When the bitumen thus flows soft and even liquid from its spring, it catches, retains, and encloses whatever it may meet with. Flowing thus he supposes it to be carried into the sea, where, by the saltiness of the water, by agitation, and great length of time, it becomes hardened, as is likewise the case with asphaltum, thus becoming amber; and being driven by the winds is thrown upon the shores opposite to where its springs exist.

Agricola had no hesitation in placing the substance among those of the mineral kingdom, considering it as a *bitumen*, from whence he knew peculiar products might be obtained.

Hartmann erroneously supposed it to be a stone of the precious kind; he accordingly classed it among gems.

Sir Thomas Browne, in his *Pseudodoxia Epidemica*, says, “Jet and amber are reckoned among bitumens,” he also speaks of their attractive qualities, in cap. iv. of his 2d book, p. 83.

Philip John Van Strahlenberg, in his *Historio-Geographical Description of the North and East Parts of Europe and Asia*, says of amber, that “some pieces of it have been found between the rivers *Catanga* and *Janisei*, towards the *Mare Glaciale*; and likewise in the sandy desert between *Mungalia* and *China*.”

“Certain modern authors,” Mr. Parkinson continues, “have adopted the ancient opinion of its being a vegetable production; supposing it to be the resinous gum of the poplar-tree, from its similarity to copal, which is positively alleged to be the concrete juice of a tree (*rhus*

copallium) of New Spain; but which, being neither soluble in water like gum, nor in spirit of wine like resin, has by many been supposed to be of mineral origin.

“ *Girtanner* considered amber to be an animal production: and supposed it to be formed by the large ant, (*formica rufa*, LINN.) Observing, that those ants raise hills sometimes of six feet in diameter, in the old pine-forests, or in those places where pine-forests have been; in those places, he says, where amber is found. His conjectures, it should seem, are founded upon a substance being formed in those receptacles of the ant, of the consistence of honey, or half-melted wax, having a yellow colour like common amber, and, it is said, yielding the same products by chymical analysis; acquiring hardness by remaining in a solution of common salt. If from these observations amber should be considered as a vegetable oil, rendered concrete by the acid of ants, as L. Methieio has supposed wax to be a vegetable-oil, indurated by the acid of the bee.”

However, the circumstance which nullifies this, and all positions, except the one originally established, is to be ascribed to an experiment directed to be made by the King of Prussia, detailed by *Junker*, afterwards copied by *Neuman*, since noticed by *Hoffman*, and related by *Parkinson*, who says, “ The King of Prussia gave orders that a search should be made for the subterranean abode of this substance; directed, most probably, by those marks which point out a spot particularly rich in bitumen, and which are very frequently observable in that part of the world: the required examination was commenced. After getting through a stratum of clay: on digging through this, a stratum appeared which seemed to be formed of wood, very old and decayed, but which very readily took fire. This stratum of bituminous wood, they generally found over a stratum of pyrites, which yielded sulphate of iron very copiously. Immediately below this, was a stratum of sand, the real matrix, or rather the depositum of amber, in which this bitumen was most plentifully found scattered in small pieces, and even sometimes accumulated in heaps.” *Hoffman*, however, supposes the amber to have been formed of the oil of the wood, flowing from subterranean heat, like the oil of petroleum, and passing through the bed of pyrites which lay underneath, thus became impregnated with the acid of vitriol, and thereby obtained its peculiar nature and appearance.

Hoffman’s chymical skill certainly entitles his opinion to much respect. The idea of *Neuman* very nearly agreed

with that of Hoffman ; he supposing the amber to be formed by the combination of the oil of petroleum with fine earth, held in solution by the acid of vitriol.

Breynius, thus accounts for the frequent appearance of insects with other foreign matter in this substance, as follows : observing that many insects penetrate beneath the surface of the earth to deposit their eggs, to change their skin, or to relinquish life ; and that vegetable matters are also carried beneath the terrestrial surface. But Mr. Parkinson remarks, that insects make but a small way into the earth, and amber is discovered at very considerable depths ; there appears but little probability that these substances become imprisoned this way. Besides, the substance which appears to be the most common matrix of amber is bituminous wood, very unlikely to be visited by insects ; it being a circumstance also well known, and which has reference particularly to this question, that bituminous impregnations are inimical to animal life, no living creature being ever found therein. Although Lord *Cromartie*, in the Philosophical Transactions, has related, that in the peat-moss, near the town of Elgin, in Murray, although no river communicates with the moss, yet three or four feet of depth therein are found little shell-fish, resembling oysters, with living fish, in great quantities, though no fish are found in the adjacent rivers, or in the water-pits in the moss, but only in the solid substance of the moss. Dr. *Darwin* considers this as a most curious fact, which is alleged to account for the appearance of such shells which sometimes appear on the surface of coal, and in the strata immediately above them ; and also for the thin strata of shells which sometimes exists over iron ore. It also appears, that, the instances of these small insects, or flies, which may have been occasionally discovered in amber, are considered by the naturalist as extremely rare ; this paucity of their appearance has occasionally induced the curious to offer large sums of money for such specimens. After discussing this subject, Mr. Parkinson inclines to accord with the learned *Dalechamp*, who, in his annotations on *Pliny*, has said—“ *Amber* is a bituminous substance, which exuding in a soft and fluid state from the clefts in the earth, where bituminous strata exist, has, during its soft and tenacious state, inviscated and enveloped these different extraneous bodies.” Against this opinion, in the idea of our author, there cannot exist an objection. Since it is not at all difficult to conceive that amber may be the solid form which the transparent fluid naphtha assumes, from inspissation, under

certain circumstances; as asphaltum may be considered to be the result of a similar change effected in petroleum.

Since the various gases through which these several substances of the bituminous family pass, before they assume these several denominations, have been ascribed as the cause of their colour, and whilst the acids through which they must have descended in their progress from one stratum to another, particularly of iron and copper, has allowed them consistency even to induration, to answer various purposes: there is, we humbly conceive, no rational objection to be made to the hypothesis of Mr. Parkinson, above delivered, why amber, jet, &c. should not have respective originals from the same source, under different circumstances of various modification.

With respect to our author's inquiry into the origin of COAL, he commences by acknowledging the limited powers of humanity, saying, that in nothing is this more obvious than in the inefficiency of our investigations relative to coal. Respecting the origin of this substance so plentifully bestowed upon us for our daily use, and continually subjected to the examination of our senses, in nothing is human opinion less agreed.

The specific gravity of some species of coal, have procured with many the application of the term *stone coal* to the whole class; and has even induced some chymists to consider it as a species of stone or earth in its progress to lapidification, impregnated with petroleum; the impropriety of thus considering it, will appear, by recollecting that on analysis of *common* coal, the proportion of earth to that of carbonaceous and bituminous matter, is so very trifling, as seldom to exceed above one-thirtieth part of the entire mass.

However, in certain circumstances, this will be found to vary: to instance the slaty cannel-coal from Ayrshire, Scotland, which Mr. Kirwan analyzed; and the stony coals of Macinaia, the analysis of which Signor Fabroni has given: in these the earthy parts amounted to a fifth, and even one-half of the mass. These substances deviate so much from the genuine character of coal, in the opinion of our author, as rather to be entitled to the denomination of *slate* or *lime-stone*. In nothing is nature more distinguished than in variety even in individuals of the same species; besides those grand divisions she constantly forms in that generic character.

Others, he says, have been of opinion that coal is entirely of marine original; and formed from the fat and unctuous

matters of a great variety of marine animals which have peopled the ocean. This mass of matter is supposed to have accumulated, in consequence of different changes which have occurred in the earth and ocean, to have been formed in various strata. For the colour is not accounted for. This opinion the author very ingeniously confutes, by showing that the natural levity of all unctuous matters militate against their sinking, which, according to the principles of this theory, must have taken place.

Dr. *Hutton*, in his celebrated work,²⁰ has endeavoured to establish a perpetual succession of worlds by a system of revolutions occurring at various periods, of indefinite duration, leaving no vestige of a beginning or prospect of an end. Agreeably to this hypothesis, the Doctor imagined that coal is formed by the slow deposition of oily and bituminous matters at the bottom of the sea. These bituminous and oily substances he supposed to have originated in the dissolution of the various animal and vegetable bodies constantly perishing on the surface of the earth; he supposed were washed off the surfaces on which it falls by rains, and being made run into rivers, it is carried by them into the sea; where it adds by its deposition to the mass which is there accumulated at its bottom. Another source from whence he supposes this to be derived, is the moss water draining from peat mosses. This moss water, the Doctor says, leaves upon evaporation a bituminous substance, which very much resembles fossil coal; and as the continued action of the sun and atmosphere upon this oily substance tends by inspissation to make it more and more dense, or bituminous, he, therefore, sees no difficulty in supposing a continual separation of this bituminous matter, or inspissated oil, from the water; and a precipitation of it to the bottom of the sea, along with the subtle earthy particles which the water also contains. These he supposed to subside together in an uniform manner, producing a stratified mass, of an immense weight of superincumbent earth, which must be thereby exceedingly compressed, condensed, and finally consolidated by the powerful influence of subterranean heat.

Without making any comment on the general theory of Dr. *Hutton*, Mr. *Parkinson* only observes, that his hypothesis as to the formation of coal is equally objectionable with the one previously noticed. For all bituminous matter being of so much less specific gravity than water, no

²⁰ Theory of the Earth, with Proofs and Illustrations, by James *Hutton*, M.D. 1795.

intermixture with impalpable earthy matter, could be susceptible of affording sufficient gravitation to sink it through that fluid.

It seems, the opinions of Dr. Hutton have been combated by several ingenious writers, and with respect to the origin of coal, none have been more successful in opposition than Mr. Williams, in his *History of the Mineral Kingdom*. This gentleman, our author says, possessing a very considerable degree of knowledge on this subject, the result of actual observation, confining himself to those inferences which seemed necessarily to flow from the phænomena which he remarked, concluded that the antediluvian timber was the origin of our present coal; he made this conclusion from having observed the grain and texture of timber so frequently in coal. Observing, that in his opinion, the origin of wood is so plain and evident a truth, that he can almost point out the particular species of wood which composed particular species of coal.²¹ More particularly delivering his opinions, where he says, in another place:—"I am of opinion that the antediluvian timber floated upon the chaos or waters of the deluge, until the strata of the highest mountains were formed with much of the other strata in our sight; and that, during the height of the deluge, and the time in which the greatest part of the strata were forming, the timber was preparing and fitted for being deposited in strata of coal; and that the coal with their concomitant strata were among the last which were formed. But how and by what means every thing in this great work was fitted and carried on, belongs to higher wisdom than mine to explain."²²

In another place,²³ Mr. Williams says, he proposes another probable source of coal: "I believe I may call it a real one, and that is, the peat, or antediluvian bog." The grounds upon which he formed this opinion were, from having seen coal bearing a strong resemblance to peat; and, on the other hand, having seen peat, on being dried, nearly as black and as hard as coal. Mr. Williams is convinced that petroleum is not at all concerned in the formation of coal, although he acknowledges that some species of petroleum may have a near relation to coal. The conversion of petroleum into coal has been opposed by many; the learned *Wallerius* himself objects to its having vegetable matter for its origin. He was confirmed in this opinion,

²¹ *History of the Mineral Kingdom*, v. i. p. 251.

²² *Ibidem*, v. ii. p. 212.

²³ *Ibid. v. ii. p. 194.*

from the petroleum being found enclosed in mountains and cavities where there was no existence of vegetable matter. Considering also that nature is no less disposed to form an oil in the mineral kingdom than in any of the others, he concludes that *naphtha* is generated from a most subtle inflammable mineral matter, combined with water by the medium of an acid. *Petroleum* he supposed to be formed by the addition of calcareous earth to the naphtha, dissolved and retained by the acid part. From the further combination with earth he supposed maltha was produced; and by the excision of this, asphaltum.

Monsieur Tingry, in his observations on some extraneous fossils of Switzerland,²⁴ considers the *deritus* of organized bodies buried in the earth, to be the true matrix of the different liquid and solid bitumens; believing that these organized bodies are made to assume those characters which distinguish them, more or less, from the substances from which they originated, by the *influence alone of mineral vapours*. He supposes the different states of hardness, tenacity, or fluidity, which characterize coal, maltha, petroleum, &c. to be entirely the consequence of spontaneous decompositions, effected by *mineral vapours*, and particularly by a certain quantity of water. These substances, he supposes, to thus undergo, during the revolution of ages, and in the silence of nature, an analysis similar to that which takes place in enclosed vessels becoming heated in consequence of their slow decompositions and new combinations; and thus having resolved into charcoals, which frequently manifest the entire form, or at least the characteristic marks of organized bodies.²⁵ This operation, he supposes, is beyond doubt, accelerated by the presence of certain mines of iron; since, he observes, that Derbyshire furnishes a mixture of iron and manganese, which takes fire spontaneously on being moistened with linseed oil. Subterranean fires, he, therefore, conjectures may be produced by the mixture of petroleum, with a similar ore of iron with that just mentioned.

He adds, — “ It is reasonable to conjecture that the remains of vegetables accumulated in large heaps, and exposed to the effects of those particular combinations which occasion the heat of certain mineral waters, or to the influence of volcanic fires, may have undergone a real distillation; and that the substances thus formed, meeting with water

²⁴ Transactions of the Linnean Society, v. i. p. 57.

²⁵ Ibidem, v. i. p. 59.

which impeded their further decomposition, have been carried to the surface of the earth, and appear there in the form of naphtha, &c." Under other circumstances, he conceives that these same oils, thus detached by distillation from the wood, have filtered insensibly into the beds of sand and clay, and thus have produced the formation of coal and bituminous schisti; whilst, under other circumstances, these oils, accumulated in the interior cavities of the earth, have assumed the consistence which we have observed in mineral pitch.

Our author coincides with M. Tingry respecting the decomposition of vegetation; but observes, later observations, and particularly those of Mr. Hatchett, have clearly demonstrated that however difficult it may be to account for the different states in which bitumens are found to exist, the action of subterranean fires and the operation of distillation cannot have been the agents which have occasioned these varieties in the forms under which these substances appear to us. It may be proper to remark, with respect to this supposed influence of subterranean fires, that Dr. Hutton and many of the French chymists have adopted the same idea to a considerable extent.

Dr. Darwin, it appears from the sentiments in his *Botanic Garden*, and the notes accompanying that beautiful poem, has embraced the same opinion with respect to the production of bituminous substances, as expressed in the first part of this article—the process of vegetable fermentation as their origin.

Mr. Parkinson says, "Mr. Kirwan differs entirely in opinion from each of the conceptions previously given, with respect to disintegration and decomposition of primeval mountains containing a large portion of carbonaceous and bituminous matter. That this novel and interesting suggestion may have the benefit of that learned and truly scientific gentleman's own words, our author furnishes them. "My opinion," Mr. Kirwan says, "is that coal-mines or strata of coal, as well as the mountains or hills in which they are found, owe their origin to the disintegration and decomposition of primeval mountains, either now totally destroyed, or whose height and bulk are now considerably lessened. And that those rocks anciently destroyed contained most probably a far larger proportion of carbon and petrol than those of the same denomination now contain, since their disintegration took place at so early a period."

"On this supposition," Mr. Kirwan proceeds to say, "I

think the formation of coal-mines, and most of the circumstances attending them, may be reasonably accounted for.

" And first, as to the seams of coal themselves, and their attendant strata; they must have resulted from the equal diffusion of the disintegrated particles of the primitive mountains successively carried down by the gentle trickling of the numerous rills that flowed from those mountains, and in many cases more widely diffused by the copious streams. By this decomposition the feldspar and hornblend were converted into clay, the bituminous particles, thus set free, reunited and were absorbed partly by the argil, but chiefly by the carbonaceous matter, with which they have evidently the greatest affinity; since they are separable by boiling water from the former, and scarcely by the strongest heat in close vessels, from the latter; and even in an open fire only, by a heat much superior to that of boiling water.

" The carbonic and bituminous qualities thus united, being difficultly miscible with water, and specifically heavier, sunk through the moist, pulpy, incoherent, argillaceous masses, and formed the lowest stratum, unless in cases when their proportion to the argillaceous particles was so small that the latter had subsided and coalesced before the former could have been reunited; in that case the clayey particles formed the lower stratum of indurated clay. But if the petrol were in the greater proportion, it sunk first in the form of soft bitumen, carrying with it the clay, and forming beds of shale, according to its proportion. By oxygenization, it becomes specifically heavier than water."²⁶

Our author confesses the hardihood and temerity of attempting to overturn the opinions of a man so well-informed as Mr. Kirwan is allowed to be on chymical and mineralogical subjects; yet he discovers objections which he thinks may be advantageously opposed to his theory. Observing, " In the hypothesis of Mr. Kirwan, the most obvious difficulty seems to occur in admitting the subsidence of so light a substance as bitumen through the waters of the ocean. In no form, either solid or fluid, do we know of any pure bituminous matter, or even when combined with oxygen, which is not of considerably less specific gravity than water, and consequently as Mr. Kirwan himself observes of the unctuosity of marine animals, whilst he is examining the theory of the celebrated Arduino, it should rather float than sink in the sea; nor even do the carbonaceous matters with

the bitumen entirely remove this difficulty. Mr. Kirwan supposes the carbonaceous as well as bituminous particles to be separated by the disintegrations of the antediluvian mountains, and then to enter into re-union, and suffer precipitation through the water. Such the author has previously endeavoured to prove as actually taking place in every case where the thickening of substance and darkening in colour of any bituminous substance is going on. In consequence of the addition of oxygen to the thin limpid naphtha, a combination of that principle with the carbon ensues, and charcoal or oxide of carbon is formed, and the fluid becomes thicker and darker, assuming the form of petroleum. By a continuance of this process, these effects are produced in a still higher degree, and the hard dark bitumen jet is formed. But every one of these substances, we perceive, is of such a specific gravity, as when pure to be constantly found to swim in water. The possibility, therefore, of substances of this nature sinking through the moist, pulpy, incoherent, argillaceous mass, as Mr. Kirwan describes it, certainly does not appear; neither could it possibly be admitted, even if such a subsidence were granted, that such materials should form, as Mr. Kirwan also conjectures, the lowest stratum."

The author next adverts to the impracticability of such subsidence, on the ground of the impossibility for these strata to be thus formed, because the specific gravity of the strata forming the roof is so much more specifically ponderous than the strata of coal itself. The disintegration of which Mr. Kirwan speaks, he supposes to be so complete, as to have converted the hard and close-grained hornblend and feldspar into clay. By so minute a disintegration, the bituminous particles must have been set free, and consequently would either have arisen to the surface, as the earthy particles from a superior gravity would have sought the bottom. But, on the supposition of Mr. Kirwan, the bituminous and carbonaceous, the earthy and metallic particles, being all suspended in the same fluid, a deposition of oxygenized carbon and bitumen first takes place, which is succeeded by the descent of the earthy and still more ponderous metallic particles.

A difficulty of equal magnitude appears in the conception of the mode of formation of beds of slate, by the subsidence of the bitumen. Mr. Kirwan says if the pétrol were in the greatest proportion, it frequently *sunk first, in the form of soft bitumen, carrying with it clay, and forming beds of shale or bituminous shale*, according to its propor-

tion. Our author considering this position says, with all care and every deference for opinions emanating from such a source, he is yet unable to discover how the effects he describes could possibly result from such a combination of circumstances.

Our author next adverts to Mr. Hatchett's most valuable observations on bitumens, and he is decidedly of opinion that coal as well as other bitumens are of vegetable origin; although he does not deny the possible intermixture of animal matter.

The next opinion which he cites in this respect is of M. Patrin, who states that volcanoes throw up large quantities of bituminous and argillaceous matter: he derives the origin of coal from this source, supposing coal and its interposed beds of stone to have been deposited by the alternate ejection of bitumen and of earthy matter from marine volcanoes. How, he says, can it be supposed, that coal can have been formed from vegetables, when considerable beds exist at the height of 12,000 feet in the *Cordilleras* of South America, and more than 6000 feet in height in the Dauphinean Alps;—when, he adds, these beds have been deposited at a time when vegetables did not yet exist, and when the waters covered the whole surface of the globe. How otherwise, he asks, can we account for the regular and alternate beds of coal and layers of stone?—such, for example, as in the collieries of Liege, where are *sixty-one* beds of coal, alternating with as many layers of stone of a vast thickness.²⁷

The last writer quoted, and of celebrity, by our author, upon the subject is the celebrated M. Fourcroy, who, speaking of the origin of this substance, says, the greater part of naturalists consider coal as the product of the remains of wood which has sunk, and afterwards changed by the water and by the salt of the sea. Coal, he observes, seems to owe its formation to the decomposition of an immense quantity of marine and terrestrial vegetables, and to the separation of their oil, which becomes united to the aluminous and calcareous earth. It cannot be denied, he remarks, that animal matters also enter into its composition; and he afterwards observes, that a considerable quantity of ammonia is yielded by the distillation of coal, which favours the opinion of its animal origin, since bodies belonging to this class of compound substances always yield ammonia during their distillation.²⁸

²⁷ Article HOUILLE, Dictionnaire d'Histoire Naturelle.

²⁸ Syst. des Connoissances Chimiques, tom. viii. p. 241 and 244.

If we, who are neither chymists nor mineralogists, presume to offer an opinion, we observe that any ideas of our own must, necessarily, be the result of observation upon the various systems which have preceded, and that they have occurred during the time we have been employed in transcribing those the afore-stated observations, and the principles which have gone before; without having previously come to any decision upon this point ourselves, therefore, our mind is not biassed by any theory whatever. Unprepared, otherwise than has appeared, for the discussion of a question of so great import; we only observe, that the hypothesis of the celebrated Huttonian system appears in our idea to be more fanciful than rational; because, although we confess, that from certain appearances in nature we have not yet seen accounted for, to hear that many of the present existing materials which constitute the terrestrial surface are not much more ancient than our most accredited system of chronology will admit the existence of transient continuity to have been; yet we can never give in to receive an idea so foreign to all our past impressions, without the admission of a greater conviction of the *truth* of Dr. Hutton's system, than has yet been made upon our mind. Indeed, had the repeated decompositions, of which the Doctor speaks, been the effect of fire, from the nature of things, its appearance must have been manifest in many more instances, than is now discoverable.

We have an historical tradition of the disintegration of the globe by the effect of water, we presume possessing strong alkahestical qualities, since its dissolution appears to have been attended with such wonderful appearances as to dissolve solid rocks; which dissolution appears to be consonant to our conceptions of the threatened destruction by Omnipotence itself. And provided it be not proved that coal strata were originally deposited in their present form by the eternal Architect of the universe, which we do not know has yet been suggested;—Mr. Parkinson's theory of the deposition taking place upon that dissolution of nature, in our opinion appears to be rationally adduced, and is equal to account for those appearances.

The next theory which appears of most consideration, is that of Mr. Kirwan, considering his intelligence in practical mineralogy, as well as in chymistry, is so justly appreciated by the general opinion of the scientific world, his thoughts must merit that attention we are ever desirous to render to superiority of intellect. The superior advantages which, in the order of time, every part of science

has received, but particularly which has been experienced by chymistry since Dr. Hutton's time, must we think allow the observations of Mr. Kirwan more credit, than can attach to Dr. Hutton's opinions. Besides, as Mr. Kirwan's theory will be found to come to the aid of M. Patrin's assertion respecting the existence of coal 12,000 feet above the level of the sea, it is entitled to respectful consideration upon that account. Therefore there is no necessity of resorting to volcanic force, to raise strata from the marine deposition:—indeed were it possible to entertain this opinion for a moment, it would be seen that coals would not have been so orderly disposed as they are now found in smooth strata of great extent. However to have them so, according to this idea, the existence of subterranean fires, must be inferred; when, instead of firm coals supercharged with bitumen as they are now discovered, every bituminous particle must be destroyed by the degree of heat necessary to fuse them; there must be besides an occasional appearance of charcoal and of scoria, intermingled in their substance.

The dispensations of nature we believe to be general, even in her very formation of all materials: consistent with such disposition and without deserting this principle, we may believe that occasionally similar effects are produced by opposite causes;—farther, since it is confessed the article coal differs in its species, why may not one species be produced by the mode suggested in Mr. Kirwan's theory, and another by that of Mr. Parkinson's?

But to follow Mr. Parkinson a little farther upon this point, in letter xxiv. which he devotes to the inquiry respecting the origin of coal, and the narration of the deluge, by MOSES, the Hebrew historian; he says, after having intimated the difficulties he had to encounter, that should his opinion be found to differ from those of the eminent men, who have preceded him, he confesses that although this may be his misfortune, yet he is bound to apprise us, that this difference will not be material; in some instances, he says, so small as to consist merely in extension; and, in others, in little more than a modification of those opinions.

Thus the explanation offered will be found in perfect coincidence with that of Mr. Hatchett, Mr. Williams, and M. Tingry, as far as regards the derivation of coal from vegetable matter; — differing only from that of the two former gentlemen, in its attempt to ascertain the nature of the process by which the change is effected; and from that

of the latter gentleman, in not admitting the necessity of mineral vapours or subterranean fires and distillation; Which opinion was entertained before the real properties of carbon, and its nigrific principle of blackening, was ascertained; men commonly judging from the most obviously apparent circumstances, from facts perpetually occurring to their senses, formed their opinion that because coal was *black*, fire was necessary to make it so; and without reflecting that the ignitious operation, would at the same time, have devoured the bituminous or inflammable principle, and entirely have *charred* the substance, if not otherwise have injured it, and rendered it unfit for those purposes to which it is now so well adapted. The best opinion which can be adopted, upon due examination of all the circumstances, and which these facts will admit of, to us appears to be, that coal is a product by vegetable matter, first formed and afterwards receiving its colour by the previously detailed processes: and which has been buried at several distinct periods, but chiefly in consequence of an universal deluge; and which, after having been reduced to a fluid state by bituminous fermentation, has assumed a certain modification, of that inflammability, which bitumens in general possess by the oxygenization of their carbon, and by an intimate and peculiar intermixture with various earths and metallic salts.

With that respect we are conscious of feeling for the opinion of so eminent a geologist, as is Mr. Parkinson, we seize the present opportunity to point out that we have not seen that he has accounted for the ammonia, which M. Fourcroy mentions, unless it be in that passage where he admits the *possibility* of animal oils commixing with bitumen. Mr. Parkinson proceeds—“ In examining the solidity of this hypothesis, the attention must become particularly engaged by three different circumstances, which offer themselves as necessary objects of inquiry. In the first place, the necessity presents itself of ascertaining whether the deluge could have been capable of occasioning that deposition of the matter of which *coal* is formed. In the next place, it should be determined whether the circumstances, under which this matter has been deposited, were likely to occasion it to undergo such chymical changes as would produce its transmutation into coal. Lastly, the examination is requisite to discover how far this *presumed* change accords with the general economy of nature; or, at least, with that part of it which has been permitted to us to understand.

“ The general tenor of the Mosaic account of the creation of the world, as well as several distinct expressions employed by the sacred historian, whilst speaking more particularly of the creation of the vegetable system, yield the strongest grounds of belief that the earth in its antediluvian state was most plentifully stocked with plants and trees of every kind and size.” He quotes, to prove this position, the employment which was allotted to Adam, for “ The Lord God took the man and put him into “ the garden of Eden, to dress it, and to keep it;”²⁹ and the extensive space which this garden is implied to fill,— “ For out of the ground, (of this garden,) made the Lord “ God to grow *every* tree that is pleasant to the sight and “ good for food,—as well as the general scenery, and the most prominent circumstances in the history of the first man, all concur to show that mandate of the Creator was, in this respect, completely fulfilled, and that—“ the earth “ brought forth grass and herb, yielding seed after his kind, “ and the tree yielding fruit, whose seed was in itself, “ after his kind.”³⁰

Agreeably to the same sacred tradition, the earth was peopled from a single pair; and, from various instances, which appear in the history of their original descendants; we may perceive, that the arts which they possessed, and the kind of life which they led, accorded with those which historians of latter times have shown to be adopted by the aboriginal inhabitants of every country. Their dress was simple, and their employments, that of keeping of cattle, and tilling the ground, the occupation of man generally, in his rudest and most uncivilized state.

After a certain period, seven generations from Adam, we are told the arts of civil life began to appear, “ Jabal “ was the father of such as dwell in tents; and such as “ have cattle; Jubal was the father of such as handle the “ harp and organ; and Tubal Cain was the instructor of every “ artificer in brass and iron.”³¹ Whether this relation is to be taken literally, and that these arts were actually then invented during the eighth generation of mankind, or whether to be taken in prospect, this account was really meant to designate the regular progress of the first race of men from a rude to a civilized state, will not affect the present inquiry. A period sufficiently long to allow a prodigious increase of vegetation which adorned the surface of the earth, must have elapsed, whilst the first families of mankind were thus emerging from

a state of rudeness to that of civilization. For during that period, in which a people exist only in a state of nature, as it is termed, the wants which they feel, and consequently the arts which they cultivate, being few, necessity will but seldom oblige them to level the trees of their surrounding forests. Thus uninterrupted, the earth, which has been assumed to be well clothed, even immediately after its first formation, must, in the succeeding ages have teemed in almost every part of its surface with vegetable life.

From the same invaluable records we learn, after the earth had existed during a period of sixteen hundred years, the Almighty decreed that a flood of waters should be brought upon the earth, and the earth should be thus destroyed. All the *fountains of the great deep*, we learn, were broken up, and the *windows of heaven* were opened. "Forty days and forty nights it rained upon the earth:—all the high-hills that were under the whole heaven were covered:—and the waters prevailed upon the earth an hundred and fifty days."³²

Our author now states that various objections had been offered against this, the Mosaic account of the deluge. Men of the greatest learning and piety had doubted whether the relation should be taken literally, or not; and have hesitated much in their opinions as to the extent of the earth's suffering. Some have questioned whether there was a sufficiency of water to deluge the highest mountains of the earth, whilst others, among whom may be reckoned the Bishop of Clogher, have imagined the deluge should not be considered as having covered the whole earth. His Lordship was of opinion that some parts of the then habitable world, which by the force of the deluge were then separated into islands, and were divided from the continent whereon the ark rested, were in some sort exempted from the common calamity brought on the rest of the world by the deluge; "insomuch," his Lordship says, "as the continent of America, and many islands in the East Indies are at present partly inhabited by wild beasts and noxious animals, which it is not reasonable to imagine, that any body could or would have imported thither since that time."³³—See a subsequent note on *Fossils on the Mamatowa-Kost of Siberian Tartary*.

To account for this particular circumstance, may not, perhaps, be easy; but, however, it is not necessary to be done in proving the prevalence of the deluge over every

³² Genesis, vii.

³³ Vindication of the Histories of the Old and New Testament.

part of the known world, since testimonies sufficient to this fact are yielded by those wonderfully preserved remains of former ages, which form the general object of our author's inquiries; and which have since been discovered in every part of the known world, even in the very spots which his Lordship pointed out as being exempted from the fate of the rest of the world, the most astonishing and interesting remains of organised beings have been discovered, at once proving that the waters of the deluge did cover the whole earth's surface and leading us to regard the globe we inhabit as one vast tomb of a former world.³⁴

“ Assuming it then as proved, that the deluge did overwhelm the whole of this globe, it next becomes necessary to inquire what changes were then effected. Very different opinions have been maintained respecting the degree of change which took place on the earth in consequence of the deluge; some have supposed that the change was but slight, or superficial, affecting the upper surface of the earth only; —whilst others, considering the declaration of the Almighty's intention to destroy both the earth and its inhabitants, (God said, *I will destroy them with the earth,*) conclude that all the strata of the antediluvian earth were actually dissolved, and the liquid which effected this was some very powerful alkahol, which dissolved the connecting medium of constituent corpuscles and separated them one from another; and that in this state of separation, they were mixed with a large quantity of water, so that the whole was reduced to a fluid colluvies.³⁵ The attempt to determine what changes were actually effected at this period, cannot be expected to prove successful; but, perhaps, a near approach to truth would be the supposition that the force of this immense quantity of fluid matter must have been such as would have destroyed the whole of the original surface, and to have considerably deepened and widened these excavations, which had contained the antediluvian waters; whilst, by the falling of vast subverted masses, other cavities would be filled and former channels choaked up. By the violent agitations which the waters must for a considerable time have endured, the earthy matters they contained must have suffered the highest degree of attenuation and division, and by their gradual deposition in those situations in which the waters were less agitated, or where they became stagnant, must have formed horizontal strata, where the surface on which they were deposited was

³⁴ Vide Bishop Burnett's dedication of his *Theory of the Earth* to the King.

³⁵ Treatise on the Deluge, by A. Calcott, 1761.

flat, and new mountains where this deposition was made on the elevated subaqueous remains of former mountains.

“ Possessing no other data from which we can infer what form the surface of the antediluvian world bore, we can only rest on the mention of its rivers and high hills, which give us reason to suppose it might have borne some affinity with that which the present surface of the earth presents to our view; and the sides of the hills, with their correspondent valleys, and the extended plains, it may be contended, were covered with their appropriate tribes of trees and plants. Assuming these for the generalities of the earth’s external form, it is evident that the waters, whether supplied by rain alone, or by other sources, as seems to be implied by the *breaking up of the fountains of the great deep*,” (nay, though the author says it is implied, we go farther, and contend it is positively expressed, explicitly, and in its direct and natural import,) “ must necessarily have first filled the lower parts of the earth. When it attained a greater height, then must this powerful element have rushed in torrents from valley to valley, breaking down or surmounting every intervening obstacle; and laying prostrate the vast forests, with which the surface of the earth was every where clothed. Of the trees thus overthrown, the lowest stratum of vegetable matter would be formed, which would soon become buried beneath the sediment, which would be continually depositing from the superincumbent waters, loaded with every species of earthy and even mineral matters, with which would be impregnated the effects of an alluviation more ponderous than we can possible conceive. As this volume of water increased, the sides of the mountains would become subjected to the violence of its action. The roots of the trees which grew on their sides, would become loosened, and the trees themselves, with the earth in which they had grown, with various other vegetables, which had been generated and nourished in the same matrix, would fall into the flood, and form a fresh stratum of vegetable matter. Thus would a mass of vegetable matter, immense beyond conception, become subjected to the domination of the powerful element. These several strata of vegetable matter would become covered by strata of earth formed by the gradual deposition of ponderous but minutely divided particles, which would soon form a covering so compact as would be able to resist the ordinary fluctuation of the water. Similar successive strata, constituted by the similar subsidence of masses of vegetable matter, and of finely divided particles of earth, may be supposed to be thus

continually forming, until the water had covered the tops of the hills.

“ Thus may perhaps be explained the situations of distinct strata of coal, separated by repeated stony strata.

“ From what cause it proceeded, it will, perhaps, be impossible ever to determine; but there is certainly reason to believe that the waters of the deluge possessed a very considerable solvent power over even those earths which we consider as most untractable. From the intermixture and crystallization of these, proceeded those siliceous and spathaceous veins which alternate with and intersect the various strata, which form that part of the earth which has been subjected to an examination.

“ Not only the form, but the substance, of the surface of the newly formed post-diluvian world, must have differed very much from that which existed before the flood; vast and innumerable must have been the changes it must have undergone, before the respective situations of the waters, and dry land could have made an approach to stability.”

L'Abbé Pluche states, in his *Histoire du Ciel*, “ That this change is supposed not to have been confined to the earth alone;” but, he says, “ it is rationally conjectured, that the whole solar system, as far as respects our planet, underwent a proportionate alteration:” he instances “ the uncertainty of seasons and vicissitudes of weather, change of atmosphere, the obliquity of the ecliptic,” &c. Mr. Parkinson proceeds: “ From the violent action of the waters at the period of their first effusion over the earth, as well as during their residence and at their departure, the continuity of the earth must have been broken; in many places necks of land must have been left, forming, according to circumstances, isthmuses or promontories; vast masses of earth, considerably undermined, would remain on the superior parts and on the acclivities of mountains; and as vegetation would doubtless be rapidly renewed upon the waters retreating, these projecting parts would soon be covered with the verdure of vegetation.

“ But the newly formed surface of the world, perhaps for a considerable period, would be continually undergoing a change of its form: the waters, urged by violent tempests, and agitated by receiving the immense fragments of falling mountains, might separate those necks of land of which we have just spoken, and which its slower action had been continually reducing: the divulsed parts of which, with the vegetation they bore, would sink in the waters of the deluge. Thus, also, by the force of tempestuous winds, and even by

the gradual influence of weather, large projecting and dependent portions of mountains, with their newly produced forests, would frequently be sinking in the surrounding waters. Thus would additional layers of vegetables be repeatedly formed over those strata of vegetables which had first been overthrown by the violence of the general deluge.

“ And when the greater part of the waters of the deluge had drained off, and after the surface of the globe again became divided into water and dry land, the lower and more excavated parts would necessarily retain the water for a long time; thus, as well as the rivers and seas, would immense lakes be formed. In these lakes would the numerous tribes of aquatic plants flourish, which, as the waters at last subsided, would cover the bottoms of those hollows with a mass of vegetable matter, in its turn covered (in consequence of repeated falls of rain and from land floods, it is presumed, with particles of sands and earths) forming a deep coat of earthy deposition, which drying gradually, would secure the subjacent strata from air. From the numerous revolutions which the newly formed earth would be destined for a time to undergo, many of these hollows might be again filled with water. Adjoining lakes might burst through their interposed mounds, and thus refill them; or among the numerous mountains which helped to form the basins of these lakes, some which had been weakened in their bases by the previous action of the waters, might now become more effectually undermined, and might fall into the lake beneath, and thus force the water beyond its newly acquired limits. In new lakes thus formed in the cavities of newly existing ones, aquatic vegetation would again go on, whilst a compact stratum from the subsidence of the suspended earth would form at the bottom; and when the waters themselves had drained away, a deposit of vegetable matter would be formed, which would, like the former, become covered with a stratum of mud, capable of acquiring, as in the former instance, a considerable degree of hardness.

“ Such of the vegetable matters as might float on the last remaining waters of the deluge, might be washed into other hollows of less depth, and becoming only covered with a moderately thick coat, would become *peat-bogs*; and if left for a long series of time totally undisturbed, would, perhaps, form lakes of petroleum, like the famous one on the island of *Trinidad*.”

From a due consideration of the facts previously given, respecting the nature of coal, the very ingenious author supposed the various strata interposed between those beds of coal will be satisfactorily accounted for.

In a succeeding letter, xxv. our author applies the principles he had established, as mentioned in the early part of this division of the present article, on the produce of *bitumens*, &c. to the formation of such vegetable matter which he believed was concealed by the superincumbent strata of the earth, so formed as lately mentioned, from the consolidating matter previously supposed to be deposited over it. This vegetable material concealed and secured, as in an alembic, or equal to a chymical recipient, with a quantity of moisture, either foreign or indigenous, is now believed to be properly secured for perfecting the process of bituminization, which it is gradually suffering; a chief previously stipulated principle being the secure exclusion from atmospheric air, which, with the retention of the vapours produced in bituminization, is believed to be effected by the various strata of minerals and stoney earths which cover the various depositions. Since the change of colour from the brown of petroleum to the black of jet is found to be the consequence of a proper saturation with carbon, one of its constituent principles, of conjoined hydrogen and oxygen, conformably with these operations, the materials are believed to have been then in the most favourable situation. Because, it is said, that during the formation of coal, the bitumen is thoroughly pervaded by other substances, impregnated with oxygen, from which, by a superior power of attraction, the carbon has power to detach it, and then to engage it in combination with itself.

From what has already appeared, we behold, that whilst discussing the formation of bitumen, a chief operation was noticed with respect to its different states of fluidity, inspissation, and induration. With respect to coal, it is now observed, that its formation is regarded as the most important end of the bituminizing process. Thus constituted, he says, it would be reasonable *à priori* to conclude, that the laws of nature would decree that the substance, to undergo this necessary change, should in general be so disposed as to secure to it the desired effect in every stage of the operation. Should the circumstance of coal having existed in a state of fluidity, that is, pure bitumen, be again asserted, he shows its utter inapplicability for the purposes to which coal is apparently adapted. Hence he deduces the necessity of its ultimate induration, which is effected, as well as its colour, by the operations of the various airs inherent in the matter, or else found to pervade its neighbouring particles as before adduced. That this substance was produced as previously premised, he reverts to the still existing traces of former fluidity, which are now to be traced in the masses of coal,

which are often marked by impressions of plants, &c. The watery particles being exuded, and hardness effected, is observed to have been the case in balsams, guins, caoutchouc, and many other vegetable glutens, into which a portion of water enters in their original composition, whilst existing in a liquid state; those substances becoming once dry and hard, it is difficult again to unite them with that element. The particles of earthy matter, which may have been supposed to have sunk with the bitumen, are accounted to have formed the floor or bed for the bituminous mass, having from their superior density gravitated through it. Yet we have seen the proportion of earths still discovered upon chymical analysis, above stated, to have been *accidentally* detained in the substance of coals; which does not militate against the last position. Much of the matter of coal, likewise, mixed with various earths and metallic particles, also form the schistose or roof of coal-beds, which is combustible and burnt for ordinary purposes, affording another argument of the descent of that matter in a state of fluidity, and presumed to be formed as previously described: as were also the different *partings*, so technically termed, which are small vacuities observable between the strata serving for covering and the substance of coal itself: this also evidences a belief that the body contained, must have suffered some diminution in bulk; and what mode can account so well for this appearance, as to imagine it to have been produced by the operations previously detailed, and that of drying and hardening.

Moreover, bitumens also, in a *fluid* state, are still frequently found in the *neighbourhood of coal*. In Franche Comté, at their coal-mines, bitumen exudes plentifully in drops, which their miners call *guhr*, (tears of the mines.)

The high degree of combustibility to which the substance of coal is subject, is temporized by intermixture of some incombustible particles with the grand mass of combustible material, which serves nearly to insulate and surround the combustible particles. This appropriate division could not have been effected, had particles of earthy matter, in any considerable degree, been suffered to intermix with the pure substance.

An additional argument, to prove the truth of the position we have embraced, also appears in this, that the earth which covers the fossil wood of Munden, Professor *Hollman* alleges to be combustible, from the bitumen it contains. A similar observation is also made on the earth at the *Bovey* mines, as described by Dr. *Milles*, and as having the same quality. It is a fact sufficiently notorious, that in the neigh-

bourhood of all petroleum springs, the earth is impregnated to a very considerable thickness. In the vale of *Noto*, in Sicily, where there is a spring of petroleum discharging itself into the lake *Paulius*, the earth above it is so highly bituminized, even to its surface, that some years ago, having taken fire by accident, it burnt for several months. These facts are mentioned for the purpose of affording a rational reason why the bituminous schist which covers beds of coal, possess similar properties, which are evidently effected by the same means. This observation, we also submit, comes in confirmation of the theory of Mr. Parkinson, previously given. From the same gentleman's system, the following observations are subjoined. He remarks, that "Bitumen alone would not, however, accomplish that grand purpose for which nature formed coal; that of supplying future ages with fuel, which, by a moderate exercise of the ingenuity of man, might be made to burn with almost every degree of intensity; from that which is employed to convey to the human body a grateful sensation, to that which is necessary to fuse some of the most untractable metals.

" The rapidity with which pure bitumen burns, would not only occasion a considerable waste of it, if it were attempted to be employed for purposes to which coal is applied, but would also render it so unmanageable, as utterly to prevent its useful application to even the most ordinary purposes which coal is intended to fulfil.

" To moderate this high degree of combustibility, and to regulate the consumption of a substance so necessary to man, as to render it uniform and economical, was therefore required. To accomplish this, the intermixture of some incombustible substance with the petroleum became necessary; but to produce these characteristic properties by which coal is distinguished from all other substances of the same class, a particular kind of arrangement of the particles of this heterogeneous mass was requisite. It was necessary that the bituminous particles should be so involved and insulated on every side as to be nearly defended from the action of fire. It was also necessary that the regularity of its combustion should not be disturbed by the superadded incombustible matter existing in the mixture, in such gross particles, or in so irregular a state of diffusion, as would have been the case if the earth had remained in it, in the state in which it had subsided along with the sunken vegetable mass.

" The arrangement of the respective particles of the mass which would make the nearest approach to the attainment of the required object, would be that in which each individual

particle of bitumen would have its combustibility left unimpaired; except so far as its inflammability would have been connected by the oxygenization of its carbonaceous part; at the same time that, by the appropriate interposition of some nearly incombustible matter, such a check would be given to the spread of the ignition of one series of the bituminous particles to another, as would render their combustion sufficiently slow and gradual. Such an arrangement as this, which might *à priori* have been supposed to be best calculated to produce this effect, may be perceived to be actually employed in the formation of coal.

“ If a piece of common coal be washed in water, so as to remove from its surface all the minute shattered fragments which adhere to it, the fingers will be found no longer stained by it, and with a lens of very moderate power, or even with the naked eye, it may be plainly seen that the bituminous matter is disposed in an irregularly laminated structure, and that the horizontal surface of each stratum is finely coated with an extremely thin film, or pellicle, which may also be seen frequently to dip and pass through the substance of the bitumen; intersecting the horizontal septa nearly at right angles, and thus placing the bitumen in distinct divisions, the *parietes* of which are formed of an incombustible pellicle. This film in general reflects tints of a greyish white, but sometimes it appears with the hue of bronze. Frequently it is of a pyritous nature, shining with a bright metallic lustre; or, as in *peacock coal*, manifesting a beautiful indistinct appearance; frequently also, when the pellicle itself is of a greyish white, it will be variegated with bright yellow pyritous illinations; and sometimes spatheous or pyritous laminæ will be interposed, a quarter of an inch, or even more in thickness. On inspecting the edges of the coal, each separate lamina will be found to be composed of bituminous concretions exhibiting the conchoidal fracture, and shining with a considerable degree of lustre.

“ On letting a piece of coal fall on any hard body, thus breaking it in such a manner as will not direct its fracture, but will allow it to take place in such directions as accord with the natural divisions formed by the interposed films, the fragments will in general be found to assume the form of rhomboids or of parallelopipeds; the very form which a body, whose parts were thus separated, might be expected to exhibit on being fractured.

“ The separating pellicles or interposed septa, in those specimens which I have examined, appear to be formed of sulphate of lime, containing a small proportion of alumine,

and sometimes also of sulphuret of iron. The presence of these substances in coal is manifested by the analysis which has been made of this substance. Monsieur Fourcroy has ascertained that the ashes of coal contain the sulphate of iron, of magnesia, of lime, and of alumine; and even in asphaltum, both the sulphuric and muriatic acids were found by Du Blé in union with calcareous earth. That the presence of water has been also evident, in its original formation, is seen from the frequent appearance of calcareous spar in the interstices and cavities of coal.

“ By such an arrangement of the bituminous particles, and by the frequent interposition of pellicles of incombustible matter, as just described, not only is the combustion of coal moderated, but it is likewise so regulated, that in its employment for common domestic, or other purposes, the internal parts of even small portions of coal are so protected, from the too rapid access of the oxygen, that only the external part is exactly consumed and reduced to an ash; whilst the other part is rendered coke or cinder, and is capable of being again employed; and even with increased advantage, in many culinary and chymical operations. Here, then, are we presented with one of the many instances in nature’s works, of the obtaining the most important ends by a contrivance not less remarkable for its simplicity, than for the certainty with which it accomplishes the desired effect. It also serves to show that, in every investigation of the operations of nature, the more minute are our inquiries, the more will our admiration be excited by the discoveries we make. A superficial examination of any of the works of the creation must be sufficient to excite our wonder; but an inquiry, successfully employed, in ascertaining the means by which one, even of the least important purposes of nature, is effected, cannot fail to excite a reverential awe, and dispose to the adoration of the Supreme.”

By this means, we look rationally through nature up to nature’s God! and patient investigation alone is calculated to attain this great, this important end of our being, and, perhaps, the very occasion for our existence.

Thus we have brought the scientific and very rational disquisitions of this intelligent author, on the article of *coal*, to a close: in this place we do not forget what obligations are due for the very kind indulgence of his generous permission to take the advantage his judicious works afforded us; being most pertinent to our purpose, and his conclusions congenial to our disposition, at the time they develope *rational truth*.

In the preceding review we have taken of bituminous substances, there is a link found wanting to furnish a connection in the chain of being between bituminous and other substances where ignition is discovered to be a perceptible quality, and which constitutes their leading characteristic. This *hiatus* is supplied by the article PYRITES, of which we now propose to speak. Pyrites is a mineral substance, in which sulphur appears to form a chief constituent, and is mixed in certain indefinite proportions with various metals. Its chief properties are, that if exposed to atmospheric air, and particularly if water be brought in contact, it spontaneously takes fire. It is a species of matrix to many metals; silver occasionally has been found in it, but more generally copper and iron.

The appearance of pyrites manifests a metallic lustre of the colour of the metal which is discovered to enter into their composition: other than those possessing copper occasionally assume the appearance of gold. They are frequently found in coal-mines, and occasionally aluminous salt enters into their composition.

To the accidental commixture of water whilst in a mineral state, is ascribed by Mr. Parkinson, the appearance of what we call *mineral charcoal*. Chymical analysis infers this from metals being discovered in their composition, and from other ascertained facts. Dr. Thomas Plot, in his Natural History of Staffordshire, p. 142, relates that at Ealand in Yorkshire, one Wilson had piled up many cart-loads of pyrites in his barn for some secret purpose, perhaps to extract the gold. The roof being faulty, and admitting rain-water to fall copiously in among them, they first began to smoke, at last took fire, and burnt like coals, so that the town was considerably disturbed and alarmed.

Dr. Jordan, in his Essay upon Mineral Waters, speaking of the properties which coals possess when they contain much of the pyrites, or as the colliers call them, *coal-metal*, of heating, and even kindling upon the gradual accession of moisture, or the effusion of water upon them, states, that several such accidents have happened at Newcastle; and he particularly mentions a circumstance of this kind having occurred in London, at *Puddle-dock*. M. Fourcroy states, that a quantity having been placed in a yard, at Paris, they first began to smoke, which gradually increased; as rain fell, they burst out into a flame, and alarmed the whole neighbourhood, who feared a conflagration would ensue. In the Philosophical Transactions, vol. lli. p. 119, a curious and very circumstantial account is rendered by

the Rev. J. Stephens, M.A. who says, that “in the month of August, 1751, the air having been for some time remarkably hot and dry, was changed of a sudden by a heavy fall of rain and a S.E. wind. The cliffs near Charmouth, in the west of Dorsetshire, presently after this alteration of the atmosphere, began to smoke, and soon after they burned with a visible subtle blue flame, for several days successively, and continued to smoke, and sometimes burn, till the approach of winter; nay, ever since that time, especially after any great fall of rain, thunder, or lightning, or a high S.W. wind, which drives the sea with great violence against the cliffs and breaks off pieces of them, the cliffs continue to smoke and sometimes to burn with a visible flame, which during the summer months is frequently observed in the night-time. On examining these cliffs in the year 1759, I discovered a large quantity of pyrites, not in regular strata, but interspersed in large masses through the earth, and which proved to be martial; of *cornu ammonis* of different sizes, and other shells of a bivalve class, which were covered over, and mineralized as it were with pyritical matter; of belemnites, also incrusted over with the like substance; and the cliffs for near two miles long, and from the surface to thirty or forty feet deep, even to the rocks at high water mark, with one bed of dark-coloured loam, strongly charged with bitumen. Moreover, I found also a dark coloured substance resembling coal-cinder; some of them being powdered and washed in distilled rain-water, and evaporating it to a pellicle, it shot salts into fine crystals, and appeared to be no more than martial vitriol; one ounce of this cinder-like substance yielding one drachm of salt. I gathered up about one hundred pounds weight of the different kinds of these pyrites, marcasites, &c. which were laid in a heap and exposed to the air, and every day sprinkled with water; the consequence was, that in about ten days time they grew hot, and soon after caught fire, burned for several hours, and fell into dust.”

The following curious *optical* fact is subjoined to illustrate **OPTICS**, (see that article.)

“When the cliffs were observed to burn in the night-time, the flames were plainly perceived by a spectator at a distance; but when he drew near to the place seemingly on fire, he could perceive a smoke, but no flame. In the day-time nothing but a smoke was perceived, except the sun shined, when the cliffs appeared, at a distance, as if they were covered with pieces of glass, which reflected the sun’s meridian rays; but upon drawing near to the place where

those luminous appearances were perceived, they disappeared, and the cliffs appeared to be covered with smoke, which stunk of a bituminous and sulphureous matter."

The same writer also states his having observed the same appearance at the Lodes in Cornwall, especially such which contained a great portion of mundic and martial pyrites, he says, " Three times I have seen this flame arise from the earth in the night, and once in the middle of the day. In the night a person standing at a little distance, could imagine that the place was all on fire ; and even on drawing near the flame, he perceives himself surrounded by flame but is not hurt ; and in four or five minutes time he perceives this flame to decrease and fall into the earth. In the day the flame is of a different colour, and not much unlike the flame of a furnace. There are several mines discovered in this country by these mineral fires, where there were no symptoms of mines before."

It is submitted that to this cause the heat in certain waters may be attributed ; and also, that to it may be traced the origin of several volcanoes.

On PETRIFICATIONS.—We have yet to confess our obligations to Mr. *Parkinson's* liberality, at the time we render a confirmation of our just sense of his superior intelligence. He thinks *bituminization* is a vestibule to the laboratory of petrification ; therefore, in following him, we are happy to observe, we have not much erred.

He also observes, that the theory he proposes to offer, differs materially from those of men who have been considered as the first authorities. He, accordingly, lays those hypotheses of his predecessors before the public, which we shall also briefly state, being consistent with historical propriety.

" The earliest attempt to account for petrifications of wood on chymical principles, proceeded in the idea that the fixed parts of the wood, deprived of their watery, oily, and volatile parts, on being penetrated by the lapidific fluid, would arrest the stony particles, and thereby so secure their arrangement, that the substance thus produced should exactly represent the form and structure of wood ; and the more earthy particles of vegetables should thus abide together, and continue in their original form after being deprived of those particles by which they have been held together ; and that they should, even after the total removal of these connecting particles, instead of becoming displaced themselves, stem the percolating particles of earth, and be able so to retain them, that they should, thus combined, faithfully represent, as many specimens do, the original

peculiarity of structure of the wood. *This* was an opinion fraught with so many obvious difficulties, that another mode of explanation was soon adopted.

“ The next theory which was proposed with the hope of accounting for these changes, was that of *substitution* of stony in the place of organized matter, which was supposed by many of those who adopted this opinion to be entirely removed. Thus *Berthollet* says, ‘ petrifaction is not a metamorphosis into stone, but a removal by petrifaction, or a precipitation of the vegetable or animal matter, in the same manner as happens in metals: copper being, for instance, sometimes thus substituted in the place of iron.’ Mr. *Walch* also, in the supplementary part of *Knorr’s* splendid work on this subject, declares his adoption of this opinion to its fullest extent. ‘ Different species of petrified wood,’ he says, ‘ teach us, that all the particles of any extraneous body may successively disappear, and be re-placed by foreign heterogeneous particles, with so much regularity, that the body which is produced from them, may possess perfectly the form of the original body, preserving all its characters, and at the same time not retaining any (*aucune de toutes*) of its original particles.’ ”³⁶

Mr. *Kirwan* believed petrifaction to be performed thus, to which process he also applies the term *substitution*, describing it as—“ The introduction of stony, and sometimes of metallic substances, into organic bodies, whether of vegetable, or of the animal kingdoms, in proportion as the particles of these organic substances are destroyed by putrefaction, so as to assume the place, and consequently the form and figure of these, as if cast in the same mould. The mineral substances thus moulded, are in the most perfect sense of the word called *petrifications*. ”³⁷

Mons. *Daubenton*, is of opinion, that petrifaction only takes place in those bodies, whose composition is such, that a part of them already possess a stony hardness, for instance, such as the crustaceous coverings of certain animals, as shells, bones, scales, madrepores, &c. In substances like these, which he considers of an analogous nature, he thinks the process of petrifaction can take place, which he thinks is performed by the following operation:—“ Being long left in an humid situation, the earthy part will separate

³⁶ Recueil des Monumens des Catastrophes que la Globe de la Terre a essuies, &c. Commencé par Wolfgang Knorr, continué par ses Héritiers, avec l’Histoire Naturelle de ces corps, par Mons. Jean Ernest Emanuel Walch, 1775, tom. iii. pref.

³⁷ Geological Essays, by Richard Kirwan, Esq. p. 137.

and fall away from the cartilaginous part ; and, by filling them, accomplish the petrification in such a manner as to give the body the appearance of being still organized."

" With reference to the apparent petrifications of wood, fruits, &c. he presumes them to have been formed in the moulds which had been left by those substances in the surrounding earth ; the external surface of these bodies retaining the exact impression of the surrounding mould. But sometimes," he observes, " we discover the marks of the internal structure of the wood ;" to account for this, he adopts with Mr. Kirwan, the idea of substitution. " Here," he says, " the water carries away, gradually, the ligneous fibres, and as gradually deposits in their places the stony particles, which are necessarily disposed in the same order and in the same form with those of the ligneous parts, which have been removed since they have been distributed in the same points, and have been moulded in the same cavities which the molecules of the decayed wood have left. All the substance of the wood is thus, by degrees, removed, and its place exactly filled by a stony substance bearing the exact appearance of the wood itself. These stones, then," he says, " are in fact, not petrifications, but only stony depositions which have received the impressions of different parts of the wood ;" and he concludes, that " there is no vegetable substance which can become petrified ; and that petrifaction can only take place in animal substances, of which a part already possesses a stony hardness." He adds, " that petrified wood should possess the distinctive character of wood, by having the medullary productions. It is not sufficient to see concentric layers ; it is necessary there should be also lines traversing those annual layers, as they are beheld in the transverse section of a tree, from the pith to the bark ; and in some trees, as the cork, and green oak, even in the bark itself."³⁸

The opinions of Mons. *Fourcroy* are very nearly similar with those last delivered, he, adding, " the layers of fossil-wood penetrated by water, lose a portion of their dissoluble, mucilaginous, and extractive matter, with a part of the hydrogen which they contained. Hence they approach to a state of a pure wooden skeleton ; the external surface of the wood fibres being even decomposed, and taking on the colour and appearance of charcoal. It appears that although still woody, the fossil wood is approaching to destruc-

³⁸ *Leçons Normales*, tom. iii. *Observations sur les Petrifactions.*

tion; and that its still longer stay in the earth would destroy it entirely. With respect to petrified wood or other vegetable matter," he remarks, " it is a great error to consider it a conversion of vegetable matter into silex, as the term seems to imply. There exists," he says, " to be sure, silicified fossil matters, which present to our view, not only the texture of wood, in general, but that even of particular kinds of wood; but the greater part of such specimens, are," he thinks, " merely pieces of jasper, the fibrous appearance of which imitates that of wood:" (a mere *lusus naturæ*, we suppose; if so, we still trace a remnant of school philosophy.) "Even in those specimens where, besides concentric layers, the medullary prolongations are seen spreading from the centre to the circumference, and which is, he thinks, the only incontestible proof of the specimen having been a woody substance, and retaining its former texture and dimensions, is converted into siliceous matter. "It is necessary," he says, " to conceive otherwise of fossil bodies, bearing the marks of organization. Wood, leaves, fruit, and all other kinds of vegetable matter, improperly said to be petrified, have been gradually destroyed, almost atom by atom, within the wet earth, where it has left a hollow mould, which becomes exactly filled by siliceous earth, which the water has conveyed thither. Thus it really is not petrified wood, but only a substitution of siliceous matter, mixed with other earths and metallic oxydes in the place of wood. This species of silicification, is then," he adds, " a proof of *the complete destruction of the vegetable matter, and of the disappearance of whatever constituted its element.*"⁸⁹

Our author thinks innumerable objections oppose themselves to this mode of accounting for lapidification of vegetable substances, by the process of substitution; inquires in what manner it can be supposed that a line smaller than a hair, extending from the centre of a piece of wood to its circumference, can have its original compounds taken away, and their places supplied by earthy particles, merely deposited from water, as to preserve an unbroken continuity. Should this be conceived as possible, in the instance of a single line, can it be admitted that such a regular abstraction and supply, exactly imitating these processes, only known to be performed by organized parts, could thus take place through every series of vessels and even fibre of the

⁸⁹ Système des Connoissances Chimiques, tom. viii. p. 255.

decayed wood, and thereby produce an appearance not in the least differing from the adjacent substance. "But were even this," he says, "to be claimed as possible, were it allowed to the full extent on this hypothesis, how can the original *colour* of the wood being exactly retained, be accounted for? Can it be supposed the original molecules being thus removed, the added particles of earth derived from the surrounding mingled mass, should be so regularly placed, that the arrangement and blending of the variously coloured particles should yield an exact imitation of all the different hues, and of the disposition of the characteristic shades of colour of the original wood? In whatever point of view, therefore, this subject is seen, the impossibility presents itself, that such a process, the fortuitous disposition of the atoms by which such a substance could be formed, could perfect so exact a resemblance in the figure, structure, and colour of an organized body, that the eye, unaided by the touch, could not be able to discover the difference."

Dr. Hutton's theory is next examined. The impregnation of siliceous fossil wood, he supposes to be effected by injection of flint in a state of simple fusion by fire. "With whatever different substances," he says, "the woody body shall be supposed to have been penetrated in a state of solution by water, the regular structure of the plant would still have remained, with its vacuities variously filled with the petrifying substances separated from the aqueous menstruum, and deposited in the vascular structure of the wood. There cannot be a doubt with regard to this proposition; for as it is, we frequently find parts of the consolidated wood with the vascular structure, perfectly in its natural state and situation; but if it had been by aqueous solution that the wood had been penetrated and consolidated, all the parts of that body would be found in the same natural shape and situation. This, however, is far from being the case, for while in some parts the vascular structure is preserved entire, it is also evident, that in general, the woody structure is variously broken and dissolved by the fusion and crystallization of the flint.⁴⁰

"The first proposition which the doctor lays down, and with regard to which, he says, there cannot be a doubt, is that, 'with whatever different substances the woody body shall be supposed to have been penetrated in a state of solution by water, the regular structure of the plant would still

⁴⁰ Theory of the Earth, vol. i p. 61.

have remained, with its vacuities variously filled with the petrifying substance separated from the aqueous menstruum, and deposited in the vascular structure of the wood.' The test which the doctor has here laid down for ascertaining whether the petrifaction of wood is, or is not, an operation dependent on aqueous solution is certainly the best adapted of any that could be devised; for, as is implied in the doctor's statement, if the regular structure of the plant remain, with its vacuities variously filled with the petrifying substances separated from the aqueous menstruum, and deposited in the vascular structure of the wood; then the change cannot have been effected by any other means but an aqueous solution of the impregnating matter. Now, not to dwell on the general evidence which I think is yielded by almost every specimen of siliceous wood, I will urge the more direct evidence which is afforded by a particular specimen I possess. In this specimen, impregnated with silex, either by gradual decay, or by the mechanical action of water, the fasciculi of longitudinal fibres, which appear to have retained their natural colour, seem to have been so loosened in their attachments as to have hardly adhered together previous to their impregnation; and in some parts very considerable vacuities have been formed. In its present state, exceedingly small siliceous crystals invest every fasciculus, and line every interstice and cavity, but without proceeding so far as to entirely obliterate them, or in the least to alter the regular structure of the wood; all the remaining parts of which appearing to retain their natural shape and situation. That such an investiture of crystallization, spreading almost over the whole surface, would have been thus regularly disposed from an injection of flint rendered fluid by heat, without obliterating the small cavities and interstices of the wood, by the introduction of the melted matter, and without affecting the regular structure, or even colour, is hardly to be conceived; whilst the superposition of the siliceous matter having been gradually applied from an aqueous menstruum offers us, comparatively, no difficulties to encounter.

" In the concluding part of the doctor's observations, two positions are laid down: first, that if it had been by aqueous solution that the wood had been penetrated and consolidated, *all* the parts of that body would be found in the same natural shape and situation; secondly, that the woody structure is variously broken and disordered by fusion and crystallization of the flint. With respect to the first of these positions, it certainly does appear to be untenable, since many

specimens of fossil wood bear the strongest marks of having suffered much from decay previous to their impregnation, and surely from their long maceration and agitation in water, the pressure of surrounding hard bodies and the numerous accidents to which this wood may have been exposed previous to its impregnation, it would not be surprising if after its consolidation by the means of an aqueous menstruum, *all* its solid parts were not found in their natural shape and situation. On the other hand, specimens are frequent in which the natural shape and situation of the parts are preserved throughout, even to fibres, distinguishable only by the aid of glasses. Here, again, it may with propriety be questioned, whether in this case the injection of silex melted by heat could possibly have taken place in this wood without entirely destroying its structure as well as colour. This breaking and dissolution, in some parts of a specimen, the doctor, in the second position, considers as attributable to the fusion and crystallization of the flint. How this dissolution of the parts of the wood may be accounted for has been endeavoured to be shown above, in part; and other causes supposed to be equal to the production of the same effect will be soon pointed out. In the mean time, it may be sufficient to point out the difficulty of supposing the injection of the melted flint occasioning the destruction of the vascular structure in one part of a specimen; whilst in another part of the same specimen, consolidated in the same manner, the structure has suffered little or no injury.

“ Professor *Playfair* states, that ‘ on examination, the siliceous matter is often observed to have penetrated the wood very unequally, so that the vegetable structure remains in some places entire; and in other places is lost in one homogeneous mass of agate or jasper: when this happens it may be remarked,’ he says, ‘ that the line which separates those two parts is quite sharp and distinct, altogether different from what must have taken place had the flinty matter been introduced into the body of the wood by any fluid in which it was dissolved; as it would have pervaded the whole, if not uniformly, yet with a regular gradation.’⁴¹

“ Mr. *Playfair* here undoubtedly speaks of specimens which he has either himself seen, or which he conceives warrants this account. My objections here must be necessarily feeble, being only of the negative kind. During the

⁴¹ Illustrations of the Huttonian Theory, p. 25.

perpetual examination for several years of fossil wood, I can say, I never yet saw one in which the line separating these two parts of a specimen was quite sharp and distinct, and 'different from what must have taken place had the flinty matter been introduced into the body of the wood, by any fluid in which it was dissolved.' On the contrary, in numerous specimens now before me, in which the fibres of the fossil-wood are in some parts distinct, and in others lost, I seek in vain for any line of distinction, as to the penetration of the wood with siliceous matter; but see in all no difference whatever, in this respect, in that part where the structure is confused or where it is distinct; nor do I find the least reason to suppose that the silex had not pervaded the whole in the most uniform manner.

" In those specimens of fossil-wood that are partly penetrated by agate, and partly not penetrated at all, Professor Playfair says, the same sharpness of termination may be marked, and is an appearance highly characteristic of the fluidity produced by fusion.⁴² Here, I have again to lament the never having had the opportunity of seeing a specimen similar to those which are here alluded to. I possess several specimens of agatine, opaline, and jasperine woods, the appearance of the external parts of which resembles that of unchanged wood; but examination soon shows that these parts have also been pervaded by silex. That such specimens do not exist it is not my intention to assert; it is quite sufficient to remark, that such specimens would only prove that the petrifying matter had only been applied to one particular part of the wood; a circumstance, of which there certainly exists no reason to prohibit the occurrence, in the case of the application of an aqueous solution of petrifying matter.

" Mr. Kirwan, indeed quotes an account that the Emperor of Germany, being desirous to know the length of time necessary to complete a petrification, obtained leave of the Sultan to take up and examine one of the timbers of TRAJAN'S *Bridge* over the Danube, some miles below Belgrade. It was found, it is said, to have been converted into an agate to the depth only of half an inch; the inner parts being only slightly petrified, and the central still wood.⁴³

" What authority is due to this account I pretend not to determine, but must acknowledge, that no circumstance

⁴² Illustrations of the Huttonian Theory, p. 35.

⁴³ Juste Gesch. des Erdkorpers, 167. 1 Gesch. 222.

which I have arrived at the knowledge of would have induced me to have expected such an event. If the fact be so, it is not only an additional answer to the reasonings of Mr. Playfair, but proves, as Mr. Kirwan has observed, that siliceous particles are soluble in water and are taken up by wood, and that petrifaction is carried on under appropriate circumstances in modern times.”⁴⁴

Here ends this very ingenious and candid gentleman’s review of the several chief theories which had preceded his own system. It is a circumstance which really in the course of our transcribing had made a strong impression upon our mind, and we must not quit this portion of our subject without remarking, that previous to this last observation of Mr. Parkinson, we have not seen in either of the preceding theories any surmise upon what appeared to be most material: we allude to the circumstance of the nature of the liquid never having occurred, except in general terms; and that a great portion of the success of the operation must be regulated by *this quality*, we leave others to determine, as far as it regards the nature of the petrified substance produced, and as to the rapidity of the general process.

Mr. PARKINSON’S Theory of petrified Wood, *siliceous*, *calcareous*, and *aluminous*.—Letter xxi. v. i. He states, that whilst he was endeavouring to ascertain the processes by which bituminous substances were formed, it was suggested, that the ligneous parts of vegetables in detached pieces as well as in large masses, when placed in subterranean situations, and pervaded by moisture, pass through certain spontaneous changes from the intestine motion of their particles and the new arrangement of their principles, by which they gradually acquire a bituminous nature. “In this manner is formed bituminous wood, which if the process is not prevented, passes into the state of pure bitumen; or if exposed to the influence of certain circumstances, already particularized, a different modification of its particles ensues; and jet or some of the different varieties of coal are produced. But if the superincumbent strata be not sufficiently compact to confine the more volatile matters; if the water be in too large quantity, or not sufficiently stagnant; or if any other circumstance prevent the further progress of bituminous fermentation—the bituminous wood being now rendered unfit for the food of insects, and having acquired a considerable degree of durability, may remain

without any further change, for ages. This fact is rendered evident in many parts of the kingdom, where trees have been thus preserved from a period beyond the tradition of man.

“ In this bituminized wood, two circumstances are observable which are particularly deserving notice: the first is, that although rendered essentially different in its nature, it frequently happens that its form has undergone no change, and that the disposition of its fibres have suffered hardly any alteration. The second is, that when in wet situations, its substance is so thoroughly pervaded by water, that it may be discharged from it as from a sponge.

“ Reflection on these circumstances must show that this wood is in the exact situation which fits it for becoming a similar substance with that which most specimens of fossil wood present to our view. The form and structure of the wood, with even some of its smaller fibres are curiously preserved; water pervades every part of it, and its durability is such as to ensure its preservation until that event happens on which its consolidation appears to depend,—the saturation of the water, with which it is in every part imbued, with earthy particles, chiefly in a state of solution. These consolidating by the formation of extremely minute crystallizations, through the whole fluid mass of bituminized wood give it an aluminous, a calcareous, or a siliceous substance, without disturbing the existing arrangement of its fibres. Thus appear to be formed all those fossils, which really deserve the name of petrifications, and thus, perhaps, can alone be explained that curious phænomenon, the exact preservation of even minute fibres of the wood, still retaining their continuity, and their original characteristic disposition, whilst their substance has undergone a conversion into stone.

“ Thus, I trust, may the petrification of by far the greater part of vegetable fossils be explained. The several species and varieties of the different substances which have been thus changed, on the kind of earth, and on the state in which the particles of earth have been deposited will necessarily be the subjects of separate examinations. For although in almost every case of vegetable petrification, the earthy particles appear to have been deposited chiefly in a crystalline form, it is not meant to deny that this production may have been aided by the introduction and deposition of those fine earthy” (and we presume the author meant to have added *metallic*) “ particles, which have been merely

suspended in the water. On the contrary, in by far the greater number of instances of vegetable petrifications the combination of both or all these operations *are* easily discoverable."

Our author confesses that, "in endeavouring to account for the formation of the endless varieties of vegetable petrifications, which, from the wonderful appearances they display, and the circumstances under which they are found are considered as almost anomalies in nature, he was aware that the theory proposed respecting the formation of bitumens, will be exposed to a severe test, tried by such a touch-stone, that the degree of estimation to which it is entitled can hardly fail of being ascertained.

" Although convinced of almost the universal agency of bituminization on such vegetable substances as have been rendered subjects of the mineral kingdom, yet it does not appear to be the sole process by which vegetable matters have been preserved from total decay, a length of time, to admit of their slow impregnation with lapideous or metallic substances; the ligneous nature of some" vegetable matter, "we have already seen is of so indestructible a" tendency "as to secure its long continuance in various situations, without undergoing any material change of appearance; even after the other constituent parts of the wood have been removed either by the long-continued action of the air, or by some morbid operation of the vessels of the wood. If this species of the wood, therefore, be placed in situations, in which water holding earths," or metals, "in solution, can penetrate it, there exists little doubt but that it may become petrified. Another mode by which mineralization of vegetables may be secured, appears to be that of decaying, but comparatively recent vegetables, becoming impregnated by some saline metallic solution, of iron for instance, whilst a precipitated oxyde of the metal fills up the interstices, and involves the whole in a confused mass, as may be seen in the bog iron of Shropshire, and many other parts.

" But even admitting these instances of variation, I trust you will perceive, that the grand agent in the mineralization of vegetables is the process of bituminization; which readily melts down the ligneous substance,—that substance which yields to hardly any other process, natural or artificial, and which resists almost every other power, but that of fire. The examination of the vast variety, which vegetable fossils yield, and the attempt to explain the circumstances, will show the degree of solidity *this theory* possesses, which

thus supposes the process of bituminization to be the basis, as it were, of the petrificative process, by which the greater part of vegetable fossils have been formed.

“ The earths which are most frequently found to be the chief constituents of vegetable fossils are silex, lime, and alumine; and, according to the preponderance of either of these earths may the fossil be distinguished by the terms siliceous, calcareous, or aluminous. Unwilling to take liberties with the mode of expression, which common usage has authorized, unless able to supersede that which is already adopted, I will not urge the adoption of petrified wood, silicified wood, &c. which point out the circumstance of the substance having once been wood, but having now assumed an entirely different nature. I cannot however omit to observe here, that such words as do imply a real transmutation may frequently be employed, without meriting that degree of censure which is bestowed on them by M. Daubenton; since, although the stony nature of substances is admitted to be merely the result of an earthy impregnation, the substances thus impregnated will, I believe, in general be found to have suffered an actual transmutation,—a total change in their nature, that which was ligneous having become bituminous.

“ As the fossil wood which appears to exist most abundantly, is that which has undergone a siliceous impregnation, and as the formation of this species of fossil wood appears to be the most difficult to be explained, we will take it into consideration. But as its impregnation is here assumed to have been accomplished by a solution of the silex in some aqueous menstruum, a circumstance of which no positive proof can, perhaps, be adduced; it is necessary previous to entering into particular examination of this substance itself, to determine what degree of force it possessed, by that collateral evidence, to which we are necessitated to have recourse.

“ So regularly does the earthy matter appear to have been diffused through every part of the changed wood, and so intimate is the union which has taken place, that its deposition from an aqueous menstruum, in which it had been held either in a state of suspension, or of solution, appears to be obvious. That it has chiefly been deposited in minute crystallizations, which by their regular apposition to each other, have, at length, formed that continued siliceous substance, of which these fossils are in general composed, may be almost universally inferred, from the circumstance of most of these specimens having their sur-

face invested with a crust of extremely minute crystals ; and from a similar investure, even surrounding in some specimens every distinct *compages* of fibres, and lining the sides of every cavity without obliterating them ; whilst, in other specimens, either cavities and fissures, proceeding from a deficiency of woody or bituminous matter, are filled with a transparent quartzous mass. These circumstances are so plainly indicative of a slow deposition from solution in some aqueous menstruum, that here we might have rested our belief, if it had not been asserted, that all these effects might have been produced by the injection of silex, rendered fluid *by simple fusion by heat*. This renders it therefore necessary that we should endeavour to ascertain whether corresponding impregnations of other substances with silex, are attributable to the influence of water, or of fire.”⁴⁵

45 The Siberian Tartars call a substance, found in great plenty near the brink of the river *Oby Jenesei*, and *Lena*, in Siberia, (being somewhat similar to those discovered on the banks of *Ohio*, in America, some years since,) a specimen being to be also seen in the fossil department in the British Museum, *MAMATOWA KOST*, which the Germans denominate *Mamots*’ bones. Philip John Von Strahlenberg assures us, in his *Historio-Geographical Description of the North and East Parts of Europe and Asia*, “ That these bones do not properly come out of these rivers until after they have swoln very high, as they do at certain times of the year, and at their return into their proper channels have washed away a great deal of the lower part of the clay and sandy banks, then and then only these bones and teeth fall down with the earth of the hollow banks. They are of different sizes, I have seen some of them above four *Russian* ells long, and at the thickest part nine inches in diameter, they are like elephants’ teeth, only somewhat more crooked. They serve to make any thing that can be made out of ivory ; snuff-boxes, combs, and a thousand other things ; nor can they be distinguished from ivory, except by being sometimes a little more yellowish, which only happens when they have lain a pretty while exposed to the air. Sometimes these bones are of a blackish blue, which proceeds from the same cause. If the latter are sawed into thin leaves and polished, one may observe in them all sorts of figures, landscapes, trees, men, and beasts, which likewise proceeds from decay of these teeth caused by the air. Because it is observed that the more they are decayed the greater variety of figures are found upon them. And then those leaves which are made of that part which is not mouldered away, serve to inlay and cover small boxes and little cabinets with, as is done with amber. A great many of these teeth, which are white, are carried for sale to *China*.”

This circumstantial author then adds some observations upon these bones and teeth, and particularly refers to p. 77 and 179 of the *Das Verænderte Russland*, adding, “ I have taken a great deal of pains to come to some certainty respecting this mineral, if I may call it so ; but after all, I have not been able to obtain such an account as is capable of obviating all objections. As to this name, it doubtless is derived from Hebrew or Arabic ;” (we submit from Hebrew through Arabic.) “ This word denoting *behemot*, of which Job speaks in chap. xl. and which the Arabs pronounce *memot* ; but our commentators are not agreed what kind of animal is to be understood by *behemot* ; and *Luther*, with many others, take the word only to mean a monstrous large beast, and it seems that the *Arabians* were not at a greater certainty. However, this is certain, that they brought the word into Great Tartary ; for the *Ostiacks*, near the river *Oley*, call the *mammoth*, *Khosar*, and the Tartars call it *Khir*. Though the Arabian name of the elephant is *fyhl*,

In a subsequent portion of his work, letter xxxiii. Mr. Parkinson gives a chymical analysis of several siliceous

yet if very large they add the adjective *mehmodi* to it; and these Arabs coming into Tartary, and finding there the relics of some monstrous beasts, not certain of what kind they might be, called these teeth *mehemot*, which afterwards became a proper name among the Tartars; and by the Russians it is corruptly pronounced *mammoth*. But suppose the Arabians did mean an *elephant*; by the way, it should be remarked that the Arabic is the most copious of known languages, having upwards of 1000 names for a *sword*. By the word *mehemot*, the description which Job gives of the animal which he calls *behemoth*, is widely different from the nature of that beast. This has made some think, that Job means the *hippopotamus*; others that he means the *whale*; which we submit could never be his intention with respect to the latter, for it is thus described, ‘Behold, now, *behemoth*, which I made with thee, he EATETH GRASS like an ox;’ hence, it appears, this animal was of the *cogitative* and *mamillary* species, or one which chewed the cud and suckled, and probability strongly favours the presumption that it was of the species of the *hippopotamus*. Be this as it will, the Russian *mammoth* certainly comes from the word *bemoth*; in which opinion I am confirmed by the testimony of an ancient Russian priest, *Gregory* by name, father-confessor to Princess *Sophia*; this priest was many years an exile in *Siberia*, by whom I was told, that formerly the name for those bones in *Siberia* was not *mammoth* but *memoth*, and that the Russian dialect had made that alteration. The next question (since there are so many large animals to be found in *Siberia*) is of what kind these animals must have been; but this is not so readily answered. As to the opinion that they were *amphibious* creatures, which is currently believed by the *Siberian* populace, I have always looked upon it to be a fable?” but we think otherwise; still believing it to be of the genus of *hippopotamus*. “Nor have I ever met with two accounts of that matter which were of a piece. The author of *Das Veränderte Russland*, p. 179, says that these animals were *nine Russian ells long*; but an ancient painter, one *Remessow*, a native of Russia, who lived at *Tobolsky*, informed me, in the presence of Dr. *Messerschmidt* and many others, that he and thirty more of his companions had seen between the cities of *Tara* and *Tomskoi*, near the lake called *Tzana Osero*, an entire skeleton of one of these creatures, thirty-six Russian ells long, lying on one side, and the distance between the ribs on one side and the other was so great that, he, standing upright on the concavity of one rib, with a pretty long battle-axe which he held in his hand could not quite reach the inner surface of the opposite rib. To which may be added, that almost all over *Siberia*, there are found jaw-teeth or grinders of 20 or 24 lbs. weight each, and bones of a vast bigness; but Dr. *Messerschmidt* himself has seen the bones of an immense skeleton, of a monstrous size, lying in a heap in a ditch between *Tomskoi* and *Kasnetsko*, on the banks of the river *Tomber*. Besides, every one of the *Swedish* prisoners” (of which the author was one) “must remember that a head of one of these creatures is to be seen in the city of *Tumeen*, two ells and a half long, which the Russians reckon to be one of the smallest size. Considering what has been said, it is not to be believed that these bones are minerals and a *lusus naturæ*; and if we look upon the mighty size, and take notice both of a whole skeleton and the teeth, and at the same time observe their crookedness, it is impossible that they should be the remains of elephants. I have indeed formerly thought them to be relics of elephants ever since the flood, but there is no manner of proportion between them and the structure of this huge animal. I am, therefore, constrained to believe that these teeth and bones are of sea animals, such as the *Danes* formerly used to bring from *Greenland* and *Iceland*, and sell for those of unicorns.” By the way, if a dignitary of the church is entitled to credit, and this should follow of course, we have some strange relations in *Archbishop Pontoppidan’s History of Norway*, which would stagger even common belief, of the *kraken*, and also of the monstrous *sea serpent*; the former covering several acres, often taken for a floating island, whilst the latter will lift up himself as far out of water as the top of a main-mast of a man-of-war! The author proceeds, “My conjectures in the mean time

waters,—waters where flint is held in solution. M. Klaproth analyzed the waters of the boiling spring at Rykum, in Iceland, and discovered that 100 grains of the water contained—

	gr.
Carbonate of soda.....	3.
Sulphate of soda	5.
Muriate of soda	8.50
Siliceous earth	9.
<hr/>	
	25.50

Being the powder left after evaporation.

Dr. Gibbs has discovered⁴⁶ that 10 pints of Bath water contain about 20 grains of silex. Dr. Saunders in his excellent Treatise on Mineral Waters has also shown that silex is to be discovered where it may be least expected to be found.

Bergman had, at first, accounted for the presence of silex in a state of solution in such waters, to the natural solvent power of simple water, aided by heat; which he thought sufficient to account for the effect. It also appears

are as follows: 1st, That though nature often frames figures under the earth that imitate animals, yet I cannot be satisfied that these *Siberian* bones are a mere *lusus naturæ*, but rather relics of the flood." It should be, certainly, considered, that Job was written long since the flood, even admitting Moses to have been the author. Those bones are, besides, always found near to the banks of rivers, and the *hippopotamus* being of the class *amphibia*, and the largest animal then known, for *Pontoppidan* had not yet existed, the probability favours that those words in *Job* were presumed to come from the mouth of the Creator, calling to mind his omnipotent power. The author continues, "Rubeck, in his *Atlas*, tom. i. p. 34, says also something to this purpose. Another example to confirm the probability of this conjecture is, the whole hull of a ship with the keel to it that was found about thirty years ago," (the date when the author wrote, 1730,) "in the *Barabintzian* Tartary, far enough from the ocean. Besides this there was found, upon sinking a well at the top of a hill, near *Tobolsky*, sixty-four fathom deep in the earth, an oaken beam, quite black, not round but shaped: 2d, It happens every year that the sea swells so high on the east side of Tartary, in the bay of *Lama*, near the habitations of the *Koræiki* and *Lamuti*, that whales and other great sea animals are carried up into several rivers, and when the water falls again, are left on the shore: 3d, Nor is it improbable, since the above-mentioned *Guba Tassowskoi* ebbs and flows, that in the spring of the year when the rivers *Oby Jenesei*, and others, swell in so extraordinary a manner, such teeth or horns of Greenland sea-animals should be carried up and thrown on the banks of those rivers," he quotes a former remark made upon the horn of the sword-fish: "4th, As it may be conjectured that the *Mare Glaciale* went further into land before the flood, and at the fall of the waters left those creatures in the mud behind: for, 5th, it is observable that these *mammoths'* teeth are mostly found near the *Mare Glaciale*, in rivers which discharge themselves into the sea." Should any one else hereafter account better for these appearances, he would be willing to renounce his opinion. Believes that before the flood, water made up the greatest part of the terrestrial globe.—Chap. xiii. p. 406, *ubi supra*.

⁴⁶ Nicholson's Journal, v. iii. p. 403.

that Dr. Black made an analysis of the Rykum spring, which agrees with the above particulars of Klaproth.

In the Icelandic springs, particularly that of the Guyser, where water, presumed to be above boiling heat, it being of that temperature after its descent to the bottom, having ascended to the height of 90 feet; and another, which the Icelanders call *the gate of hell*, where the water is thrown up through a pipe or opening of 19 feet diameter, to the height of 100 feet, a siliceous *tufa* is discharged, somewhat like the calcareous *tufa* at Matlock. One of the Icelandic *tufa*, Klaproth found⁴⁷ on analysis to contain of—

	gr.
Silex	98.
Alumine.....	1.50
Oxyde of iron	0.50
	<hr/>
	100.

The above analysis will demonstrate that silex is now held in a state of solution in the aqueous menstruum, and its products will farther establish the theory of our author, and perhaps obviate his modest objections raised in a recent part of his works previously quoted. Of whom we now take our leave, with regret, because in every sentence we perceive the emanations of a superior mind.

⁴⁷ Analytical Essay, p. 408.

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